ENGINEERING NEWS-RECORD

OCTOBER 17, 1957

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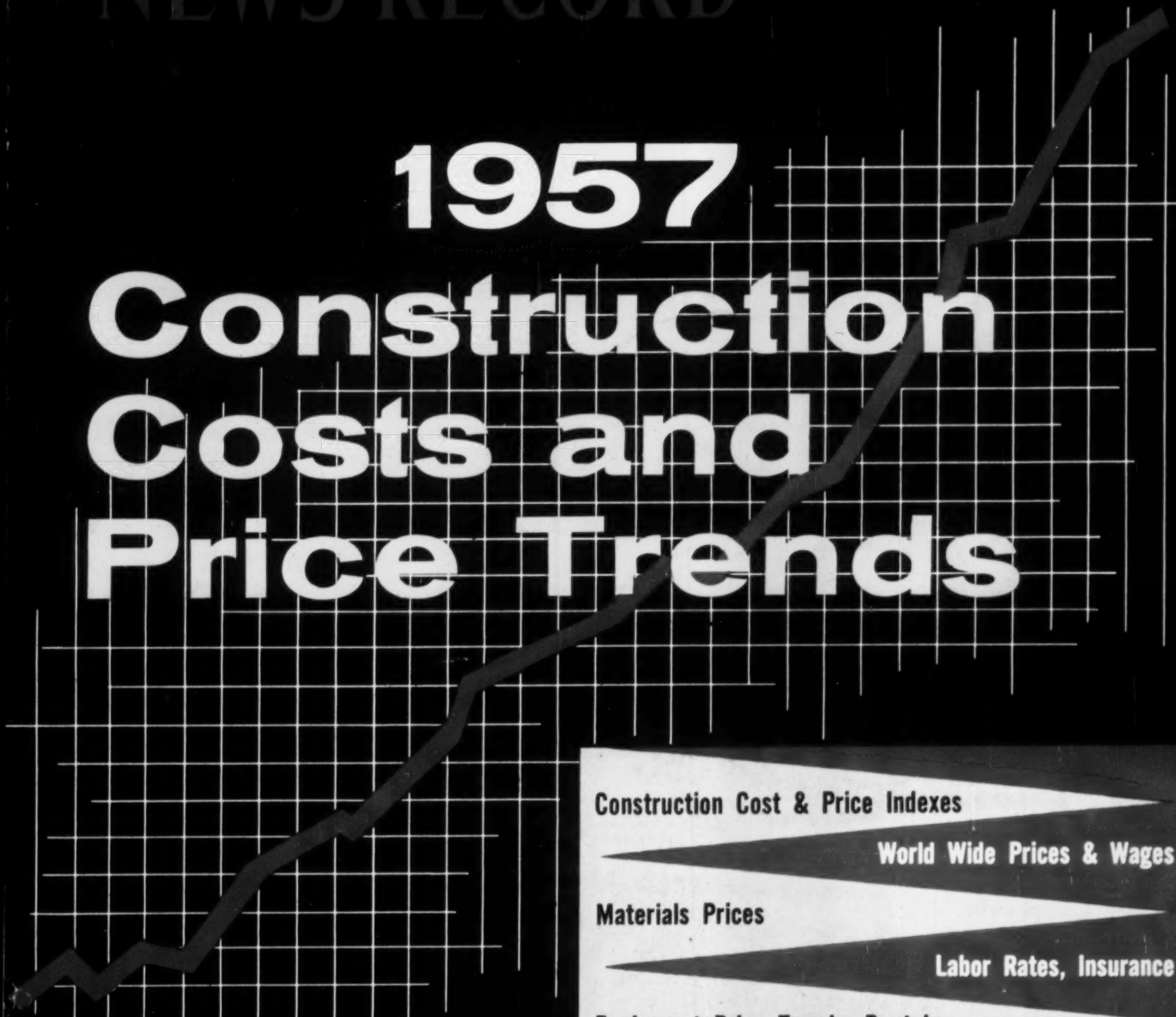

1957 Construction Costs and Price Trends

Construction Cost & Price Indexes

World Wide Prices & Wages

Materials Prices

Labor Rates, Insurance

Equipment Price Trends; Rentals

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Special Features

A McGRAW-HILL PUBLICATION

Built-in
Protection
against
Corrosion
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IRON

Here's why Wrought Iron Pipe serves longer at lower cost-per-year

Wrought iron pipe's longer life comes from its unique composition and structure. It is a two-component metal . . . high purity iron and glasslike iron silicate. The iron silicate is distributed throughout the iron in the form of threads or fibers. There are more than 250,000 fibers per sectional square inch.

These same fibers, illustrated in the magnified section above, give wrought iron its built-in protection against corrosion. When corrosion attacks, the network of these defensive fibers quickly arrests pitting and rapid penetration. As a result, corrosion is forced to spread out over the entire surface instead of penetrating the pipe wall, as happens in other materials. This effective safeguard against corrosion means that wrought iron pipe lasts longer at lower cost-per-year.

Service records in a variety of installations support this longer-life reputation of wrought iron pipe. Some of the applications where wrought iron is serving and saving are: heating system piping; air conditioning and refrigeration piping; water supply piping; sanitary system piping; sewage plant services; electrical conduit.

More of this story, and why you can use wrought iron pipe with confidence, is told in our booklet, *The ABC's of Wrought Iron.* Write for your copy today.

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Corrosion costs you more than Wrought Iron

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FLEXSTEEL Air Hose for roughest mine, quarry and construction service

A Soft, tan-colored cover to resist cutting, gouging and abrasion

B Superstrong, braided steel wire and cord reinforcement to handle high pressures, resist crushing and kinking

C Special synthetic seamless tube withstands both heat and oil

How to keep costs low on a high-pressure job

You might well start with your hose. For miles of it are required to handle king-size grouting jobs like those on the St. Lawrence Seaway project.

And it takes a super-tough hose to stand up under the high pressures you use to force grout into cracks and fissures. Add the constant pulling and hauling about it gets—the rough and rocky ground it's pulled over — and it's easy to see how hose can become a real profit-eater.

But with FLEXSTEEL Hose you keep costs at rock-bottom. Its rugged inner tube and braided steel wire "muscles" are more than equal to the high-pressure work. And a super-tough cover shrugs off the roughest handling under the roughest conditions.

Yet, tough as it is, FLEXSTEEL Hose is light enough for moving speedily from job to job. It's amazingly flexible, too—so it's easily maneuvered, even in the closest quarters. No mystery, then, why the G.T.M. —Goodyear Technical Man—recommends FLEXSTEEL for big, fast-moving jobs the country over.

How about lower costs on your next high-pressure job? Just contact the G.T.M. through your Goodyear Distributor—or by writing:

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IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

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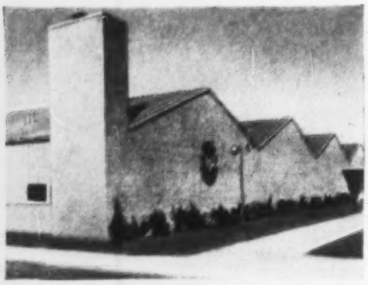
yet conserve
your precious
working capital



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with Butler
pre-engineered
buildings

Capital is far too precious to bury in non-earning facilities. Yet, when you *must* build, you may be caught between the high cost of good construction and the endless expense of cheap buildings. But do you know that you can sidestep much planning delay and expense—order buildings like punch presses—and still get quality buildings at attractive prices?

You can—with Butler metal buildings. Pre-engineered and precision mass-produced, they provide advantages possible in no other type of building. Fast construction cuts weeks—sometimes months—off building time. Future expansion or alteration is easiest, fastest and lowest-cost of any type building. Your employees will enjoy better lighting, better ventilation, better temperature control than in most other types of buildings, regardless of cost. Learn the reasons why. Call your nearest Butler Builder. He is listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write us direct.

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EIGHTY-THIRD YEAR OF PUBLICATION

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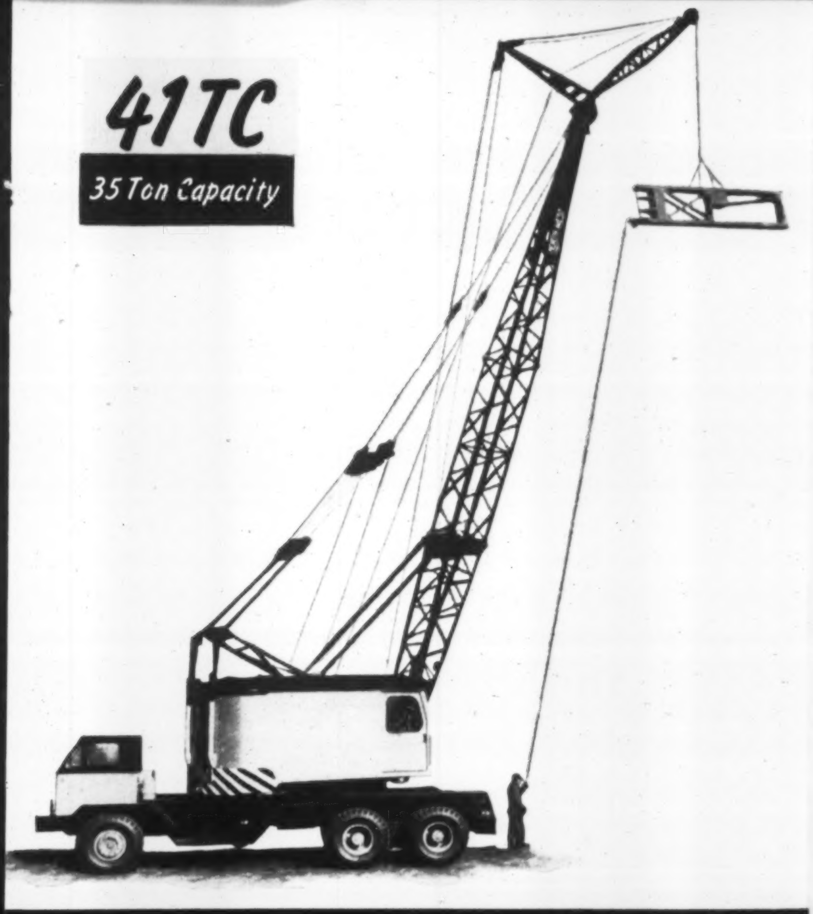
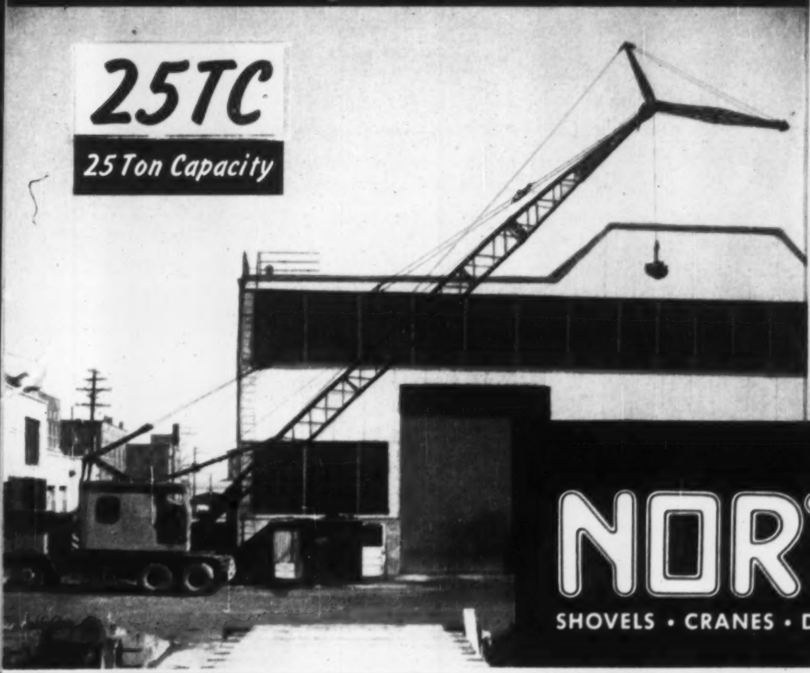


YOUR CHOICE ON RUBBER!



ALL truck cranes are not alike! Don't buy a truck crane without comparing the advantages Northwest brings you.

Look at the booms—the greater strength is obvious. Pivoted gantries are easily raised and lowered for clearance. Removable counterweight makes the reduction of gross weight a matter of minutes. Independent High Speed Boom Hoists are power controlled in both directions and operate independently of any other machine function and without sacrificing either of the main hoist drums.

Sectional boom hoist rigging and pendant lines make possible quick adjustment to boom length changes. Telescopic boom struts are standard. Extended boom point sheave shaft for pile driver leads, adjustable jibs, 3rd drums, all can be had to meet your requirements.

Lastly, remember Northwest carriers are not to be confused with carriers supplied for any other crane. They are Northwest designed—built to Northwest specifications with advantages found in no other crane carrier.

A Northwest man will be glad to give you full details—remember two sizes to select from—25-ton and 35-ton capacity. Get the whole story before you buy.

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DRAGLINE OR
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"Babe, this here's a ree-tort," explained Paul Bunyan to his faithful Blue Ox. "Fer pressure treatin' wood. Them Baxter folks never dunk it, er spray it, er paint it. They got a real fancy process: They stick the wood inside this ree-tort, lock her up fer 20 hours, and when she comes out she's BAXCO pressure treated—chock full o' presarvatives." The great logger scratched his head with a pine tree. "I dunno how they do it, Babe, but them Baxter boys shore treat wood good—they make it last forever."*

* Not quite *forever*, Paul—but wood, properly pressure treated, does last up to ten times longer. For maximum long-life protection against insects and rot, authorities agree that wood preservatives should be applied by pressure treating—and BAXCO Forest Products are *always* pressure treated. As West Coast pioneers in the wood preserving industry, our experienced engineering staff can assist in supplying you with the right preservative, the proper treatment, for any job. For a prompt quotation—inquire today.

Preservative treatments available: Creosote, Creosote-Petroleum solution, Creosote-Penta solution, Penta, Chemonite, Chromated-Zinc-Chloride, and Protexol fire retardants.

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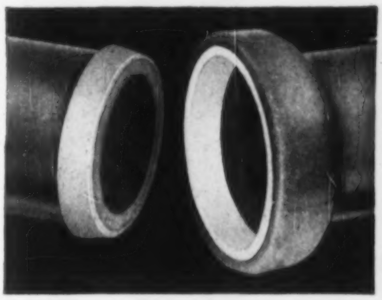
J. H. BAXTER & CO. *120 Montgomery Street, San Francisco 4, California*

lower installation costs FIVE WAYS with longer, stronger AMVIT Clay Pipe

Outstanding Mechanical Joint of Plasticized Resins of Polyvinyl-Chloride Gives Lower Cost-In-Place



A million dollar expansion program to increase production facilities for Amvit* was completed earlier this year. New horizontal extrusion machines now manufacture pipe in over four feet lengths.

Longer lengths lower installation costs, reduce the number of joints, lessen the number of pipe sections to be handled. *Here's how you can save on installation with Amvit:*

1 SAVES LABOR

No other materials such as caulking, joint compounds, hot pots or ladles are needed to make the Amvit Joint. The joint is on the pipe delivered to the job ready for use. Nothing else is needed. Just push the pipe together and the joint is complete.

2 IMMEDIATE BACKFILLING

As soon as the joint is made, backfilling can start. No need to wait for unnecessary delays caused by bad trench conditions, high-water table, unstable ground or running sand. Barricades can be removed and streets opened days sooner.

3 QUICK TESTING

No need to wait days to see if a line has passed test. A look at the completed joint will tell. Thus, engineers can inspect and accept the line allowing the contractor to receive payment quicker.

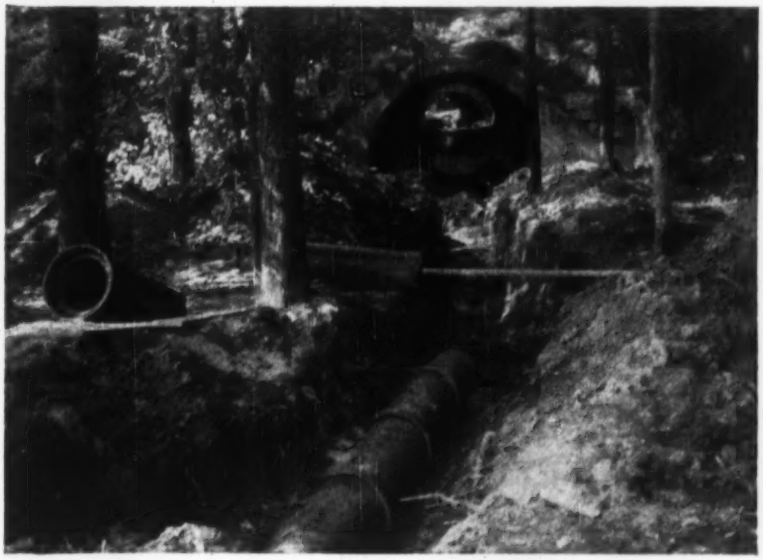
4 PERMITS DEFLECTION, ABSORBS SHOCKS

Amvit is made from a plastic which has many characteristics similar to rubber. It is pliable, permitting deflection without leakage. It is resilient, can absorb shock and vibration. This allows for settlement of pipe in poor ground conditions after backfilling.

5 COMPLETE FITTINGS

Amvit is furnished on all standard fittings, as well as pipe. This will permit a uniformly tight line from house wall to treatment plant.

For more information on how Amvit can help cut your sewer project costs, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.



Amvit line being installed in Amherst, Ohio

*T. M. Registered.

SINCE 1900

American Vitrified Products Company

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MANUFACTURERS OF: Clay Pipe, Flue Liners, Clay Liner Plates and Concrete Pipe.

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Engineers and Constructors to American industry

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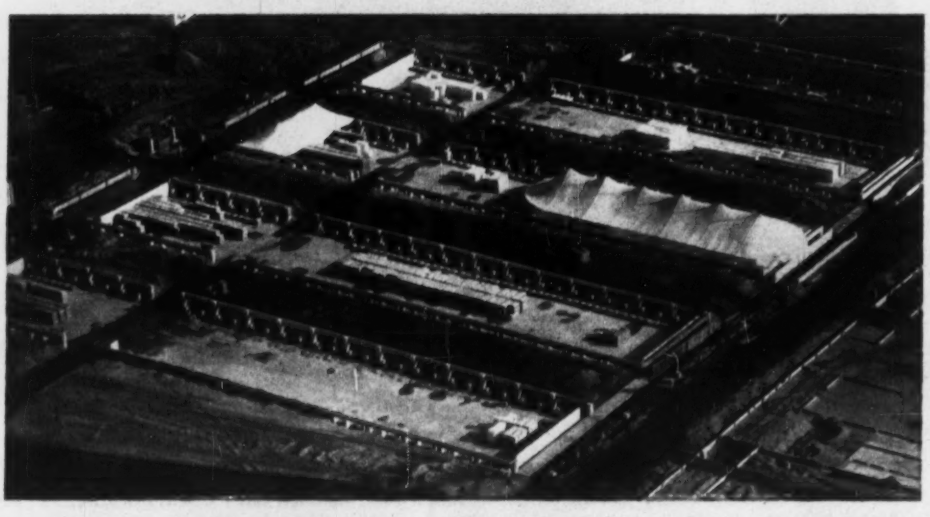
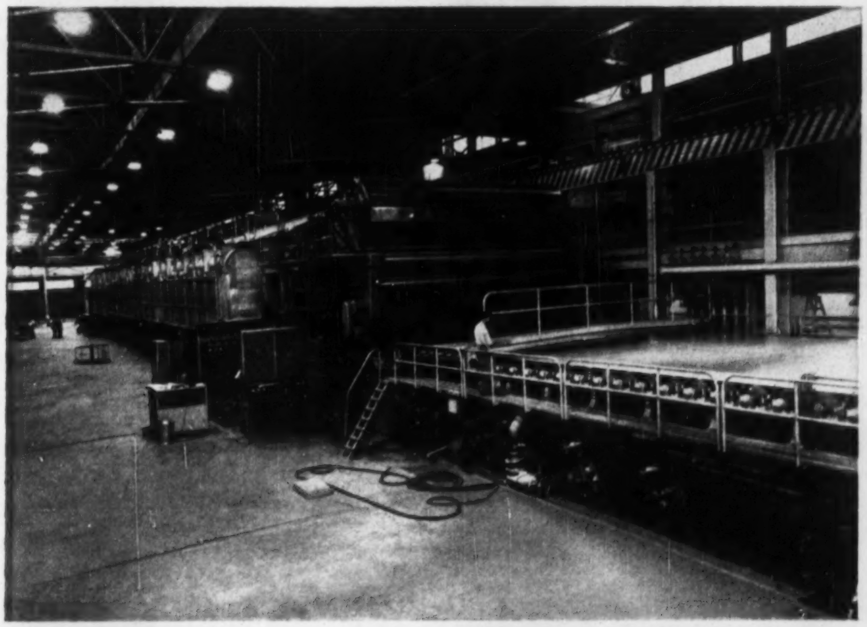
PLANT CONSTRUCTION—Bricklaying crews work under canvas during severe weather amid sprawling foundations of a section of the $150-million aluminum plant now being built near Hannibal, Ohio, by F. H. McGraw & Company for Olin Revere Metals Corporation and Olin Mathieson Chemicals Corporation. Six million cubic yards of earth were moved to dig emplacements for the Hannibal plant foundations. ▼



clean

F. H. McGraw & Company takes on the whole job or any part of the job, from first rough plans through design, engineering, plant construction and mechanical installation, down to the last details of piping, painting and landscaping. A McGraw-built plant is delivered *broom clean*—ready for production.

McGraw men, methods, materials and machines have built an outstanding record of problem-solving construction, minimum interference with current production and on-time (or before-time) delivery. We'd be pleased to have a McGraw engineer consult with you on your construction or mechanical erection needs—with no obligation, of course.



◄**INSTALLATION** of this gigantic newsprint machine for Bowaters Southern Paper Corporation in Calhoun, Tenn., was completed for scheduled start-up on Jan. 14, 1957. The machine, wider and faster than two original units at the Calhoun plant which had set world speed records, was designed to produce newsprint at speeds up to 2500 feet per minute.

THE WHOLE PACKAGE—from initial design through construction and mechanical erection—was delivered in this aircraft components plant built by the McGraw company for Fenn Manufacturing Company in Newington, Conn. ▼

Symons Forms Ganged for Anchor Walls

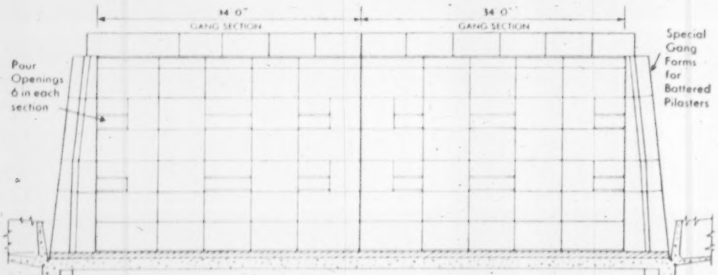
ASSEMBLY COST ONLY 5c A SQ. FT.

Modern forming methods answer the need of the jet age on the new TWA hangar at New York's International Airport. Symons 4 x 6 and 4 x 8 foot panels ganged in units 34 feet wide by 27½ feet were used for forming the 28 anchorage walls which strandle the full 80 foot roof width of the main building.

By using this method of forming, the contractor, Grove, Shepherd, Wilson & Kruge, Inc., poured the hangar in place at the cost of a precast structure. Panels were assembled on the ground at a cost of only 5¢ a square foot. It took about 15 minutes for a crane to tilt a gang form off the slab and inch it into place on the roof. 15,000 square feet of Symons wide panel forms were used in this gang forming operation. Symons wide panel forms have steel struts and 2 x 4 cross members to strengthen the panel and minimize deflection during pouring. Tie holes in the steel struts allow insertion and removal of special ties. Any strength tie may be used, including Williams removable end ties. Individual panels are built in 6′ and 8′ lengths and 30″, 36″ and 48″ widths.

Project Manager, A. R. Maxwell, working closely with the local Symons forming engineer, devised this fast, efficient method of forming. This type service is available to all contractors, as well as the preparation from your plans, complete form layouts, bill of materials and recommendations for the best and least costly method of forming —there's no charge or obligation.

Symons Forms Shores and Column Clamps may be rented with purchase option—rentals to apply on purchase price. For more information on Symons products and service send for our FREE catalog.


34' 0"
GANG SECTION
34' 0"
GANG SECTION
Pour Openings 6 in each section
Special Gang Forms for Battered Pilasters

Typical anchor wall elevation showing Symons wide panel forms ganged into units 34 feet wide by 27½ feet high. There are a total of 28 cable anchor walls on roof of the main building.

Symons

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IN SHARON, PA. *

TYLOX *Rubber* PIPE GASKETS

• SPEED PIPE-LAYING • MAKE WATER-TIGHT JOINTS

on Shenango Freeway Sewer Project

This sewer line in Sharon, Pa., won't have to be "dug up" in a few years to repair leaky or failing joints . . . despite the *tough* pipe-laying conditions apparent in the photo above. In specifying TYLOX Rubber Gaskets, engineers took advantage of a coupling material *known* for its ageless qualities . . . for its ability to make sewerage and drainage pipe joints leak-proof and root-proof for the life of the pipe itself.

But more than that, along with the certainty of getting water-tight pipe joints, their TYLOX specification assured faster pipe-laying and therefore *lower* job costs . . . Flexible TYLOX is quickly assembled to the pipe, and permits fast assembly of the line. It compensates for pipe angularities, permits wet-trench jointing and immediate backfilling. TYLOX, in fact, is the *one* pipe joint that meets all requirements of engineers, sanitary officials and construction men alike. Specify TYLOX on *your* pipe jobs.

*

PROJECT: Sharon, Pa., sanitary sewer along approach to Shenango Freeway.

ENGINEERS: Chester Engineers, Consultants, Pittsburgh, Pa.

CONTRACTOR: Joe David & Son, West Middlesex, Pa.

PIPE: 21" reinforced Concrete TYLOX-Coupled Pipe, manufactured at Erie, Pa., plant of The Concrete Pipe Company of Ohio, Inc.

5057

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This is another example of INTERNATIONAL'S policy to build the best truck—to use only the finest parts and components with quality construction throughout—to spend more to build the truck so that it costs you *least* to own!

And INTERNATIONAL Trucks *do* cost *least* to own. This has been proved* by detailed fleet cost records.

Follow the lead of the men who know trucking costs to a penny . . . fleet operators who have made INTERNATIONAL the heavy-duty sales leader for the past 25 years. Make your next truck an INTERNATIONAL.

**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

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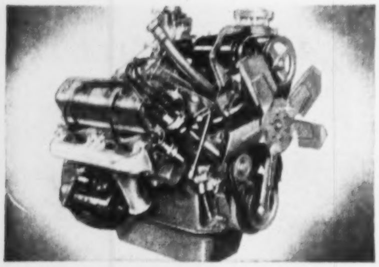
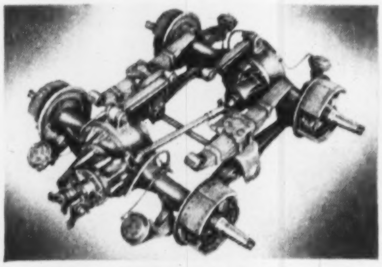
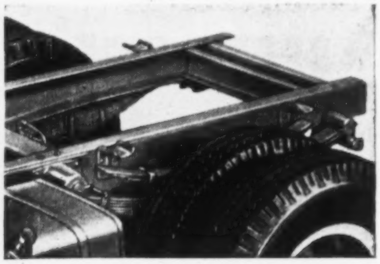


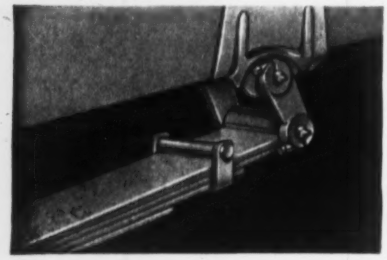
1 **Most powerful V-8's,** up to 257 hp. Highest *usable* horsepower and torque at safe, economical rpm. These *truck* engines are built for lasting, superior performance and low maintenance costs . . . greater fuel economy on regular gasoline.



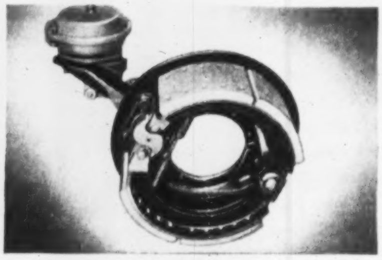
2 **INTERNATIONAL tandems** give longer, more dependable life. This unit has rubber bushings at all 10 oscillating points to reduce maintenance and lengthen life. Third differential with lock transmits power smoothly and evenly to each axle.



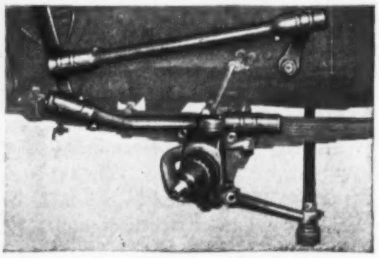
3 **Rugged frame** has plenty of sturdy crossmembers. Non-crystallizing, cold squeezed rivets are used for extra rigidity and proper flexibility on all types of service. Husky front and rear sections add to the safety margin built into every frame.



4 **Cradle action front and rear springs** cushion load and driver. Proper design and mounting provide better load support, smoother riding and longer spring life. Rear-shackled front springs for greater stability and increased life.

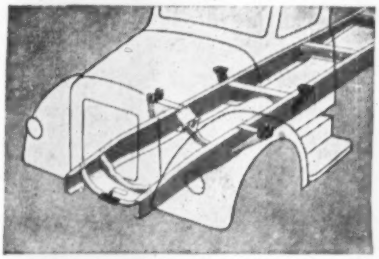


5 **Full air brakes** are standard or available on most models with lining areas to match the model, load and operating conditions. Twin-cylinder self-centering, self-energizing hydraulic brakes provide safer, easier stops and longer life.

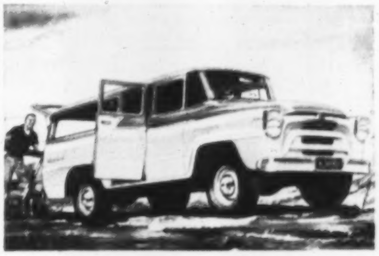


6 **Safer, easier steering** and greater maneuverability result from cam and twin lever gears with controls mounted *ahead* of front axle. Steering wheel is comfortably positioned. Power steering available on most models.

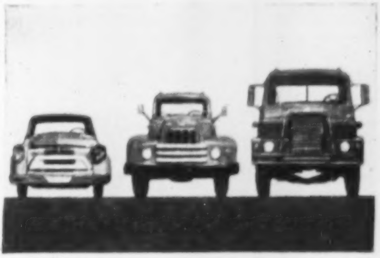
New INTERNATIONAL V-Line trucks are powered by three great new V-8 engines, 206, 226 and 257 hp. Approved clean-burning LPG system also available. Offered in conventional and COE design, 4-wheel and 6-wheel models with GVW ratings from 24,000 to 60,000 lbs., up to 65,000 lbs. GCW. You name the job, INTERNATIONAL has the truck exactly right for your own hauling operation . . . "sized," powered and geared to cost you *least* to own.



7 For cab comfort and long life. Quiet, level ride without transmitting stress to cab, fenders, hood or radiator. It's the result of wide spaced, rear shackle type cab mountings plus exclusive INTERNATIONAL 5-point rubber-insulated suspension.



8 All-wheel-drive models have the extra traction and pull needed for all tough, off-highway operations. Completely factory-built models from 7,000 to 43,000 lbs. GVW. New Travelall shown offers sturdy six-cylinder power and performance.



9 World's most complete line. There is an INTERNATIONAL "tailor-made" for every job, half-tonners to 96,000 pounders. Choice of 4-wheel, 6-wheel and all-wheel-drive models, conventional and COE design. Every one built to cost *least* to own.

Methods of Distributing Horizontal Shear

Murray Rubin's question, "How is shear distributed?" appearing in the Readers Comment section of ENR May 23, p. 8, aroused a great deal of interest, as evidenced by the letters received answering his question. For brevity, many of the calculations and formula derivations have been omitted from the letters reproduced below. Only the outlines of the method used and the conclusions and numerical values of the answers are included.

SIR—It is normally the practice for engineers to use their judgment regarding the relative importance of a structure and to proceed with the analysis accordingly. If the structure to be designed is one of major importance, an exact analysis should be considered. The additional time and expense involved in the exact analysis would be warranted by the corresponding reliable results and final structure.

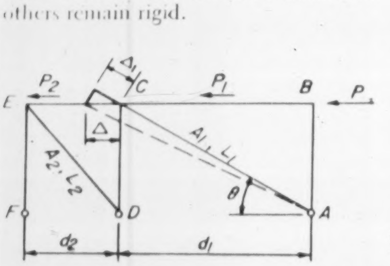
Oftentimes, the loads used in the analysis of a structure of minor importance are only approximate. The procedure should be that of analyzing the structure by several approximate rapid methods. Once again, using the approximate results, the engineer's judgment would dictate how conservative the design should be.

DONALD J. SULLIVAN
Structural Engineer
Linde Co.
New York, N. Y.

●

SIR—The frame shown is statically indeterminate. Any solution but a rigorous one, which takes into account the deformation of all the members of the structure, will be approximate.

A reasonably approximate solution would be to assume that the diagonal members only take the deformation, all others remain rigid.



Assume A_1, L_1 are the cross sectional area and the length of the diagonal AC, and similarly A_2, L_2 are area and length for the member DE. Call Δ the deformation of the frame and Δ_1 the elongation of the member AC.

$$\Delta_1 = \frac{P_1 L_1}{A_1 E} \times \frac{1}{\cos\theta}$$

or

$$\Delta_1 = \frac{P_1 L_1^2}{A_1 E d_1}$$

since

$$\Delta = \Delta_1 \frac{L_1}{d_1}$$

$$P_1 = \frac{\Delta A_1 E d_1^2}{L_1^3}$$

and similarly

$$P_2 = \frac{\Delta A_2 E d_2^2}{L_2^3}$$

from which

$$P_1 = P \frac{\dfrac{A_1 d_1^2}{L_1^3}}{\Sigma \dfrac{A d^2}{L^3}}$$

The portion of the total shear taken by each diagonal member varies directly as the area of the diagonal, the width of the panel squared and inversely as the length of the diagonal member raised to the third power.

ALEXANDER M. TURITZIN
Devenco Inc.
New York, N. Y.

●

SIR—Horizontal shear distribution can be obtained easily with the help of the "Theory of Elastic Equations". Only one correct answer for the reactions is possible as the indicated structure is in itself statically determinate (compression wind braces assumed ineffective) but has support statically indeterminate. The answer depends on the geometrical properties of the structure (length and cross-section ratios of the members).

For a general solution of the problem the structure is made statically determinate by removing redundant reaction or member forces, the latter by cutting of members. Then determine forces (member and reaction forces) of the statically determinate system for the given load and for each redundant unit force. Determine the displacements of the action points of the redundant forces in their direction for the member and reaction forces.

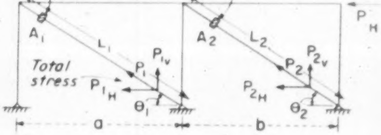
Set up the elastic equations with the condition that the displacements calculated are geometrically not possible in the original static system. The solution of the elastic equations which are based on the energy law delivers the redundant forces. Finally, calculate forces in final system by super position.

HEINZ JUHL
De Leuw, Cather & Company of
Canada Limited
Toronto, Canada

Engineering News-Record welcomes expression of opinions from its readers. Comment should be as brief as possible and pertinent to subjects of current construction importance. Letters should be addressed Editor, Engineering News-Record, 330 W. 42nd St., New York 36, N. Y.

●

SIR—In the structure below with the notations as shown, σ equals the elongation of the diagonal due to the axial load P.



The problem can be solved, assuming that all the connections are pinned and the axial deflections of the horizontal and vertical members are small compared to the axial deflections of the diagonals, and knowing that $\sigma_1 \cos\theta_1 = \sigma_2 \cos\theta_2$ and $P_1 \cos\theta_1 + P_2 \cos\theta_2 = P_H$ and

$$\sigma = \frac{PL}{AE}$$

The solution to these equations yields

$$\frac{P_1}{P_2} = \frac{\dfrac{A_1}{a}}{\dfrac{A_2}{b}}$$

and

$$\frac{P_1 \cos\theta_1}{P_2 \cos\theta_2} = \frac{P_{1H}}{P_{2H}} = \frac{\dfrac{A_1}{L_1}}{\dfrac{A_2}{L_2}}$$

shear distribution.

Furthermore, the ratio of the unit stresses in the diagonals is

$$\frac{\delta_1}{\delta_2} = \frac{b}{a}$$

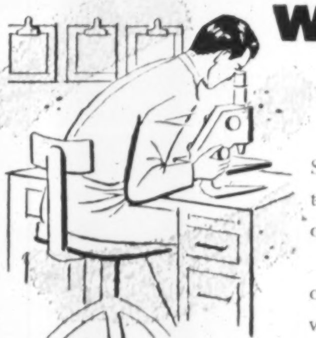
Mr. Rubin's Method 1 is in approximate agreement with the above when the areas of the diagonals are approximately equal and the bents are of ap-

(Continued on page 18)

Microscopic Enemies?

Layne Research Defends Your Well Water Supply

Magnification 800X



Shown here is an actual photograph of one of the many microscopic organisms which may occur in any type water supply.

Layne Research is called upon when well capacity is reduced. Layne Research finds out why. Production records, water analysis and microscopic examinations are some of the methods used to find the reason. Layne Research, thru years of experience in "recovering lost water," selects the correct Laynite material and method to restore well capacity.

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3/4 yd. shovel has a mighty appetite

P&H 255A–first ¾ yd. power shovel--still the leader

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Contractors agree that the 255A with its dependable day-in and day-out production can dig more and lift more—faster and cheaper. In fact, many contractors agree that performance of P&H equipment is the big factor in determining their profits.

P&H profitable performance comes from a combination of features that are found only in P&H quality equipment. In the 255A you get famous P&H stability through better weight distribution and a low vertical center of gravity. You get smooth, fast, lively swings on the mammoth P&H live roller circle. P&H designed double adjustable hook rollers assure "even keel" swings. The 255A makes maximum use of alloy steel.

Add to these features the fact that equipped with a P&H Diesel Engine with its greater torque you'll get much greater production than with a gas engine. Yes!—this ¾ yard excavator has the mightiest appetite for work—at a potential profit.

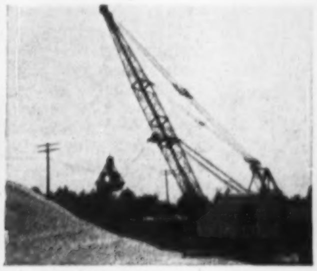
Harnischfeger Corporation
Construction & Mining Division
Milwaukee 46, Wisconsin

THE P&H LINE **Truck Cranes: 8, 10, 15, 20, 25, 30, 35 and 45 tons**
Shovels: ½, ¾, 1½, 1¾, 2½, and 3½ yards

Across the country P&H machines lead the field in power, speed, flexibility, and profitable performance

CALIFORNIA

For handling loads up to 35 tons profitably there is the P&H 555A-TC. Here are Reliance Equipment's two 555A-TC units double lifting a precast concrete panel in the Vail Field Industrial Area, Los Angeles.



LOUISIANA

In the 1½ yard class, Schwartz Supply Co. profits from the lively swings and dependable performance of the P&H 655B. It is shown unloading material for their concrete mixing plant near New Orleans airport.

OHIO

Beavercreek Excavating Co. of Dayton depends on their ½-yard P&H 155A trench hoe to dig water mains and lay pipe economically and at a profit on State Highway 4 project in Butler County.

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Milwaukee 46, Wisconsin

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Sauerman News Briefs

S

SPECIAL EDITION OF SAUERMAN NEWS

Brief items about the Sauerman Method . . . Crescent DragScrapers
Slackline and Tautline Cableways . . . Durolite Blocks

Sauerman Bros., Inc. • 632 South 28th Avenue • Bellwood, Illinois, (Chicago Suburb)

Waste Disposal Problem is Solved with a Tautline-Scraper

A Foote Mineral Company plant is using the Sauerman Method to solve a difficult sludge removal problem. A 2-yd. Tautline-DragScraper has proved to be ideal for the job. The sludge is handled safely and efficiently—men or machines need not travel on the material, since only the DragScraper and cables enter the disposal area.

The DragScraper distributes the sludge from the discharge point to a natural valley about a thousand feet long by several hundred feet wide. It is connected to a 2-wheeled plate carrier which runs on a track cable between the headpost and one of the tail masts. The operating cables permit the DragScraper to be hoisted free of the material—a great advantage over conventional hauling methods. A Sauerman 3-drum hoist provides DragScraper power.

(Condensed from Sauerman News No. 148.)

DragScraper Uses Island for Parking Lot Fill

An island in the Kalamazoo River was used for parking lot fill by the Harrington Construction Co. of Fennville, Michigan. The job was handled by a Sauerman 3-yd. Crescent DragScraper and carrier assembly used with an Insley WB crane.

The hoisting line of the Insley served as track cable, running from the hoist drum through the middle sheave of the boom tip to a tree anchor on the island. The drag cable was attached to the front chains of the Crescent.

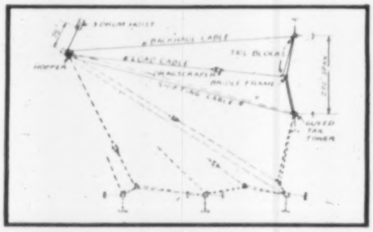
After digging and hauling to bank, the track cable was tensioned to lift the DragScraper and gravity return it to the excavation over 400 ft. away. Round trip took about a minute and a half. The 70-ft. crane boom was supported by two back stay cables leading from the boom tip to two tractors used as anchors.

(Condensed from Sauerman News No. 149.)

DragScraper Supplies Gravel for 82 Miles of Turnpike

More aggregate production was needed by Southern Michigan Materials, Inc. to supply structural and, upon completion, the maintenance and incidental needs for 82 consecutive miles of the Ohio and Indiana Turnpikes.

This demand was met with a new plant and a 5-yd. DragScraper which supplies gravel at the rate of about 275 tph. Digging goes to a depth of 75 to 80 ft. Power is provided by a Sauerman three drum hoist driven by a 325-hp. diesel. The rapid-shifting bridle provides a means of changing the DragScraper's line of operation by placing the tail block attached to the bridle in another position along the 250-ft. span between the two steel tail towers.

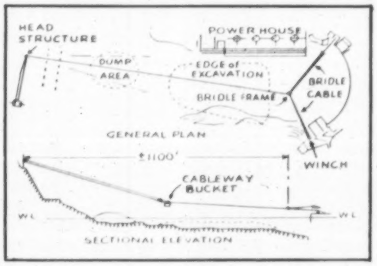


The hoist is pneumatically controlled by the operator from the hoist house. His location gives him excellent visibility of the entire pit and most of the plant.

The parent company, Northwest Materials, Inc., has completely excavated another pit nearby with a Sauerman 2-yd. Slackline Cableway. Northwest also uses a small scraper for stockpiling and reclaiming material from storage.

(Condensed from Sauerman News No. 145.)

De-Rocking a Tailrace



When the Washington Power Co. completed its Cabinet Gorge power plant and dam, an accumulation of rock at the discharge of the draft tubes had to be removed to insure unobstructed flow for the tailrace.

A Sauerman 2½-yd. Slackline Cableway, equipped with a rapid-shifting bridle system, was selected to do the job. Over 28,000 cu.yds. of rock varying in size from 6 in. to 5 ft. have been removed since the Slackline was installed. It is a permanent installation and is used periodically to clear the area in front of the draft tubes.

The Slackline operates on a 1000-ft. span. Material is excavated from 35 ft. of water and conveyed in the 2½-yd. bucket to a waste pile about 150 ft. below the tubular steel head mast. Power is supplied by a hoist located 190 ft. from the mast. The bucket and carrier assembly rides on a track cable, the lower end of which is attached to a rapid-shifting bridle frame controlled by a 10-hp. motorized spool-type winch. The rapid-shifting device permits the bucket's line of operation to be shifted laterally.

(Condensed from Sauerman News No. 143.)

MORE NEWS AND INFORMATION

Issues of Sauerman News giving greater detail about the installations on this page are available on request. For full information, tell us your interest or requirements and ask for catalog. Contact Sauerman Bros., Inc., 632 S. 28th Ave., Bellwood, Ill.

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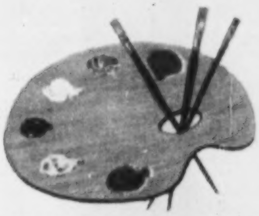

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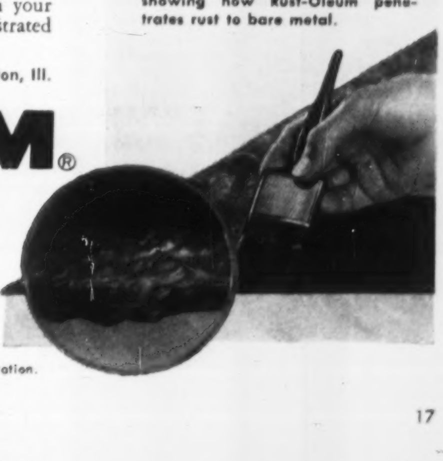

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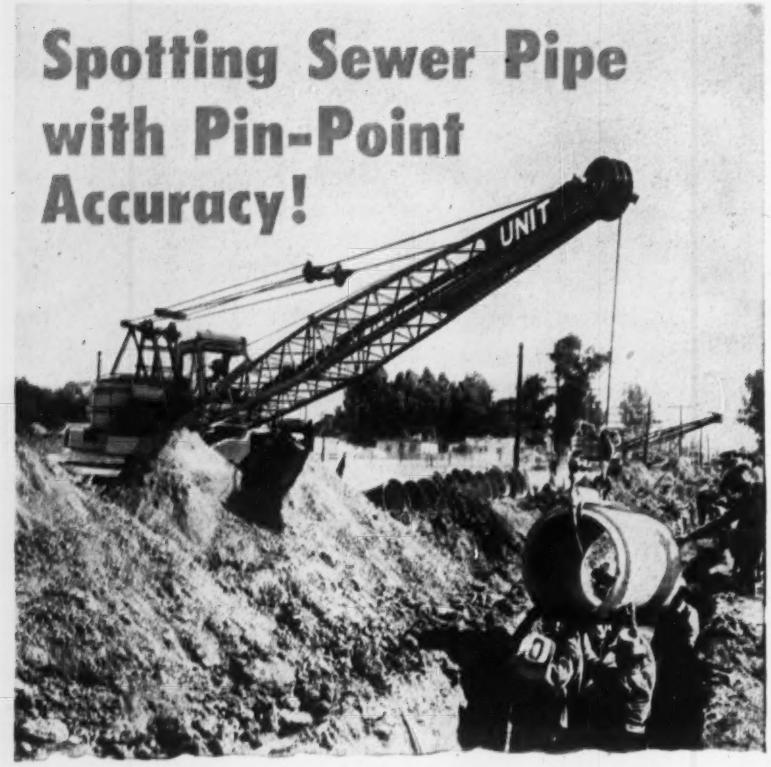

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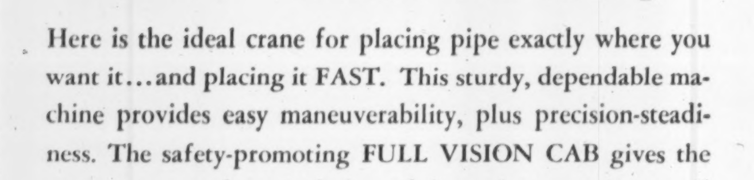
Geared for Maximum Lifting Jobs

proximately the same width. Method 2 is more or less the opposite of the above as it overlooks the load deflection relationships. Method 3 is not applicable since the structure does not behave as a beam.

Method 4 can be derived in a manner similar to the above, however the structure must be yielding.

Method 4 is the best of the four methods considered since it has a rational basis. I favor my method since the structure is analyzed for the design loads.

MICHAEL JORDAN
Ensign CEC USNR
Lakehurst, N. J.

•

SIR—Horizontal shear is transmitted to the foundations by the tension in diagonals. Horizontal and vertical members have their cross-sectional areas several times larger than diagonals and stresses induced by the load P smaller than diagonals. Therefore axial elongation of these members may be neglected, and horizontal displacement of the horizontal "rigid" member is equal to the horizontal projection of the elongation of diagonals.

Hence, using notation L_1 a_1 and L_2 a_2 for the length of the diagonals and their angles with horizontal members for long and short span respectively, we may write

$$\frac{S_1L_1}{A_1E}\cos\alpha_1 = \frac{S_2L_2}{A_2E}\cos\alpha_2$$

$$\text{and } S_1\cos\alpha_1 + S_2\cos\alpha_2 = P$$

From the above, the stresses in the diagonals are

$$S_2 = \frac{P}{\left(\frac{A_1L_2}{A_2L_1}+1\right)\cos\alpha_2}$$

$$S_1 = \frac{P}{\left(\frac{A_2L_1}{A_1L_2}+1\right)\cos\alpha_1}$$

Once the diagonal stresses are known, the computation of column reactions is a simple matter.

It may be seen that, if the diagonal's sections are proportional to their lengths, A_2 L_1 = A_1 L_2 and method 1 may be applied. For A_2 L_1 = A_1 L_2, depending on desired accuracy, method 1 or 4 should be used.

A. MYSTKOWSKI
Civil Engineer
Ebasco Services Inc.
New York, N. Y.

•

SIR—The distribution of shear in diagonally braced bents is not a difficult one to solve by an exact elastic analysis. As a means of estimating the shear distribution for a preliminary analysis, the basis of Southwell's relaxation methods

(Continued on page 26)

BENDIX 2-WAY RADIO UPS PROFITS 12 WAYS

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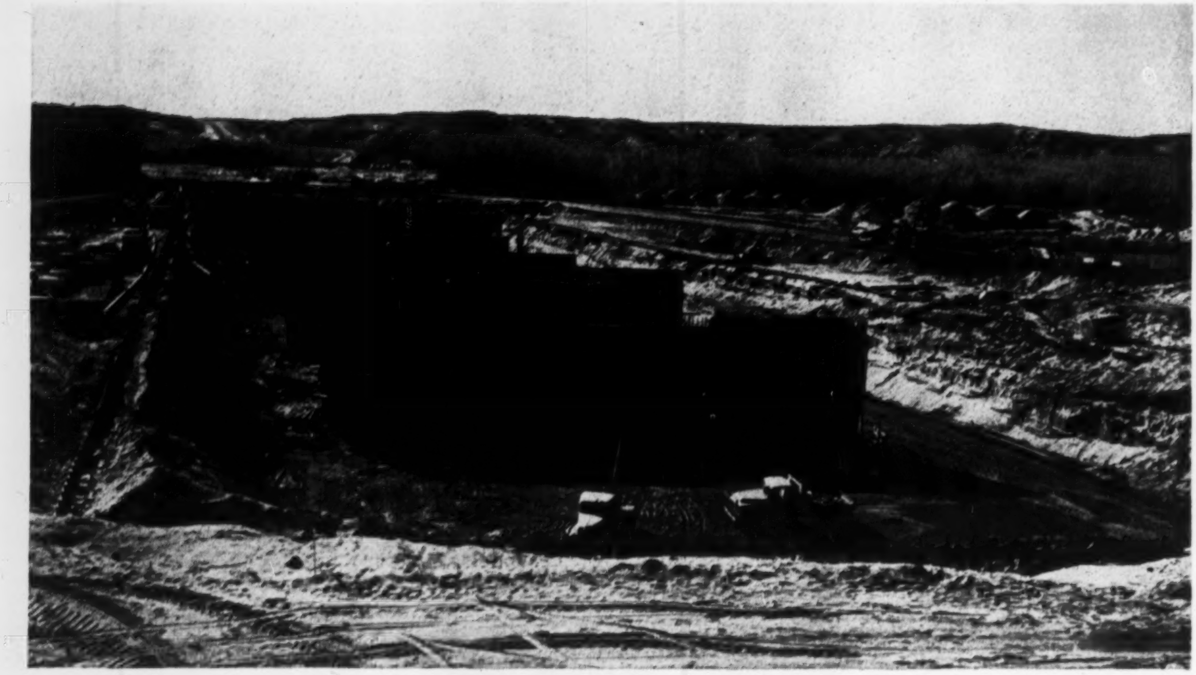

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"Build seven bridge piers, base them 18½ feet below a wet, sandy riverbed, at an elevation of 3500 feet... and do it in a hurry!" Such was the order confronting contractor Gordon H. Ball during construction of a new section of U. S. Highway 66 near Victorville, California, for the State of California.

Aware of the difficulties involved with a project of this type, general superintendent W. W. Haapala and job superintendent Joe Farrell immediately called on the John W. Stang Corporation.

Acting promptly upon the STANG recommendation, a system of STANG wellpoints was engineered and installed. At an elevation of 3500 feet, the single-stage STANG system achieved a drawdown of 18½ feet and completely dewatered the area to be excavated. *This speedy dewatering, done at a much lower cost than by other methods, allowed project completion ahead of schedule and at a profit!*

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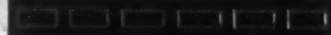
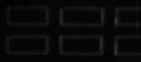
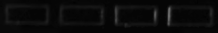


6 UNITS ABREAST FOR MAXIMUM COVERAGE

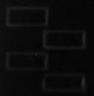


6 UNITS IN TANDEM FOR MAXIMUM ONE PASS CONSOLIDATION

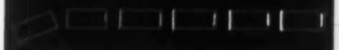


4 UNITS (or it might be 5) TO EXACTLY FIT JOB WIDTH REQUIREMENTS

5 UNITS IN TANDEM AND STAGGERED, VARIABLE FOR A WIDE RANGE OF WIDTHS



4 UNITS TOWED AT SIDE OF TRACTOR. IDEAL FOR ONE PASS WIDENING OPERATIONS.

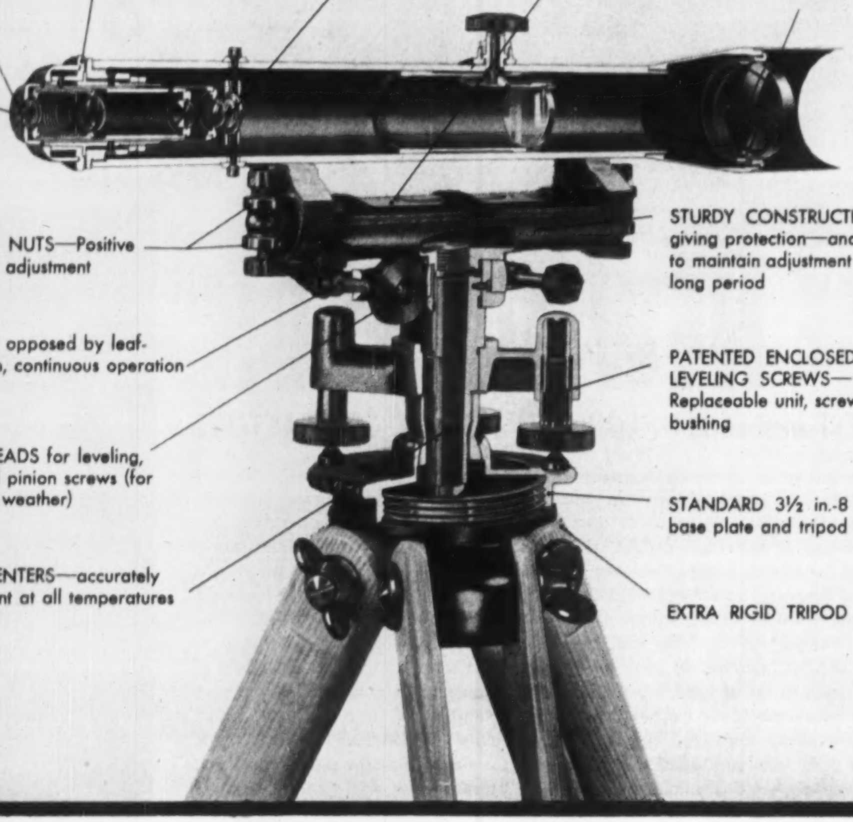


SHOULDER COMPACTION IS AUTOMATIC. End unit automatically assumes this position — no adjustment required. Prevents raveling.

ANY ARRANGEMENT DESIRED OF VIBRATORY UNITS IN THE WORKHEAD TO FIT THE JOB MOST ADVANTAGEOUSLY IS QUICKLY AND EASILY ACHIEVED.

The Gurley Engineers Level

Wye or Dumpy Types



VARIABLE POWER EYEPIECE
Permits adjustment of magnification when illumination changes

COVERED GLASS RETICLE—Cross lines on glass. Covered for protection and easy cleaning

LEVEL VIAL—Finely-ground, sensitive, uniform in movement

SUPERIOR OPTICS—Made in Gurley's optical department to precise standards; coated for greater light transmission

NON-METALLIC EYEPIECE CAP (for comfort in extreme weather)

HAZE FILTER—Improved image contrast under nearly all light conditions

LEVEL ADJUSTING NUTS—Positive opposing nuts hold adjustment

STURDY CONSTRUCTION giving protection—and rigidity to maintain adjustment over a long period

TANGENT SCREW opposed by leaf-type spring; smooth, continuous operation

PATENTED ENCLOSED LEVELING SCREWS—Replaceable unit, screw and bushing

NON-METALLIC HEADS for leveling, tangent, clamp and pinion screws (for comfort in extreme weather)

STANDARD 3½ in.-8 thread base plate and tripod head

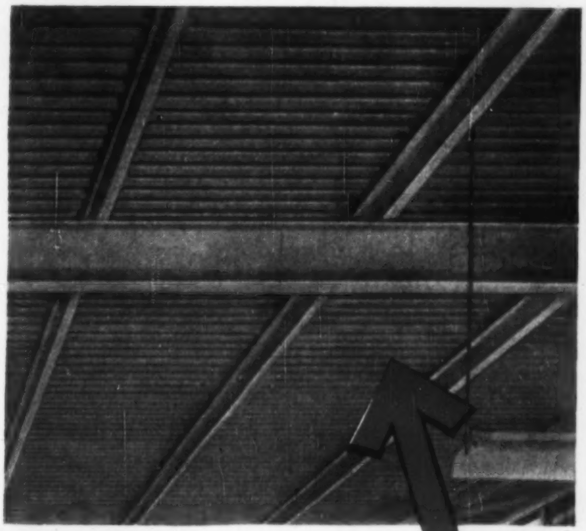
LONG TAPERED CENTERS—accurately fitted; free movement at all temperatures

EXTRA RIGID TRIPOD

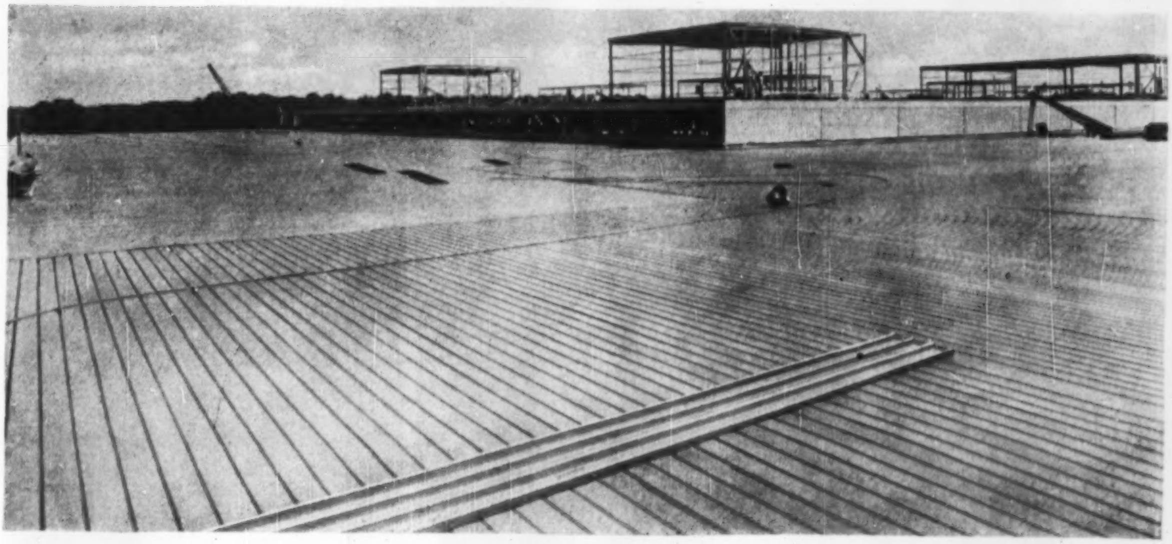
Model 372 Dumpy Level

GURLEY

W. & L. E. GURLEY, TROY, N. Y.



It saves steel as it saves time...



It's Wheeling Tri-Rib Steel Roof Deck!

Wheeling Tri-Rib Roof Deck is easier to handle, simpler to install. With no complicated connecting joints, Tri-Rib installs in a hurry.

Steel deck construction is light and strong – buildings go up faster, steel requirements are cut. So Tri-Rib permits fewer supporting columns, shallower footings and eliminates many subpurlins.

Better yet, Wheeling Tri-Rib Roof Deck lasts longer . . . gives dependable, trouble-free service. That's because it's made of Cop-R-Loy – the copper-bearing steel that's demonstrated its long-lasting ability in actual use!

Get further details from our catalog in Sweet's or the nearest Wheeling warehouse or sales office.

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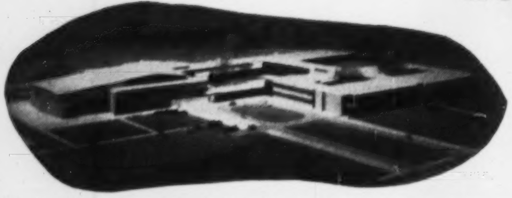
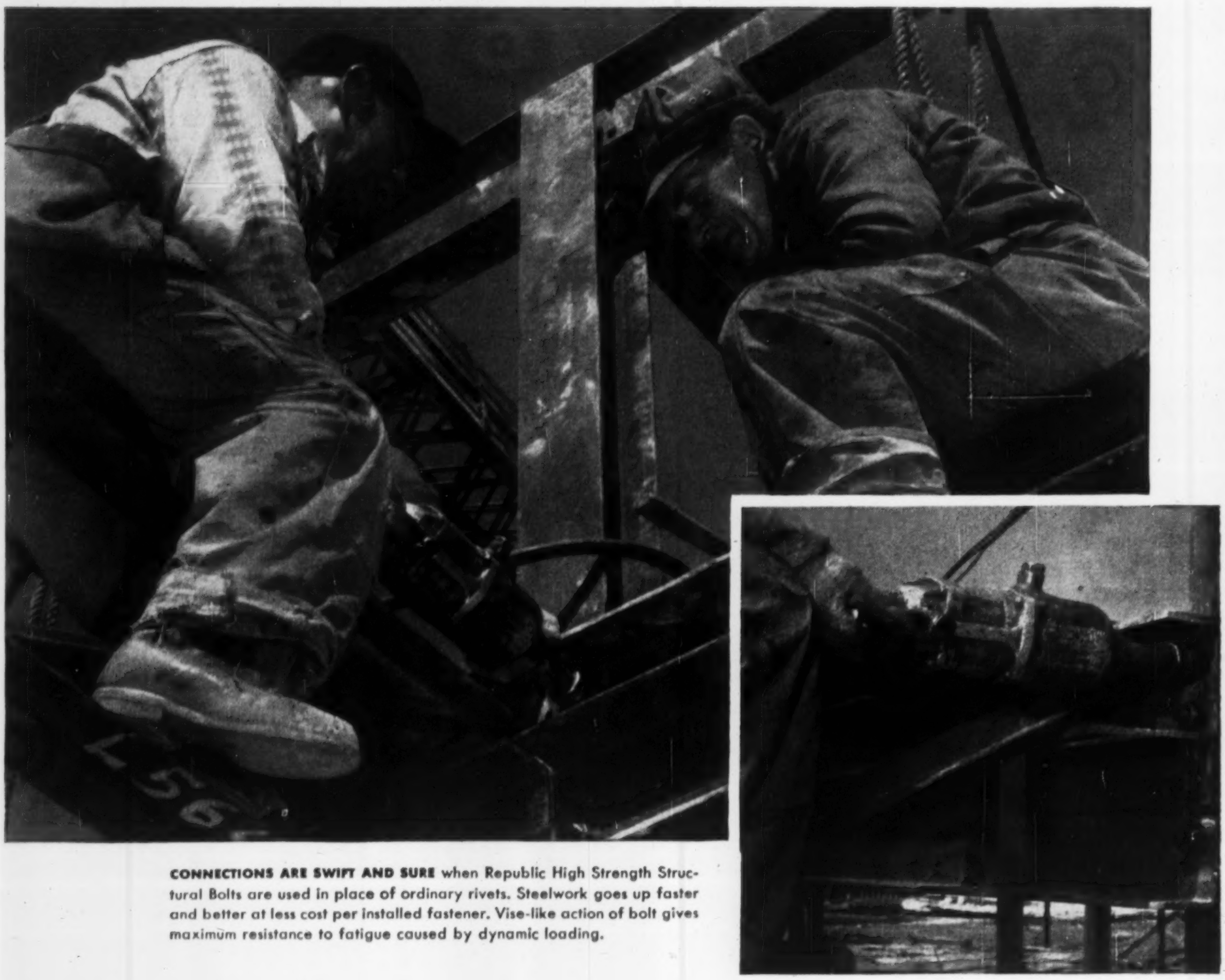
Wheeling

Wheeling's Warehouses are strategically located throughout the country to give you speedy, on-time delivery on all warehouse-stocked items. Consult the Wheeling warehouse or sales office nearest you. ***Warehouses:*** Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Madison, Minneapolis, New Orleans, New York, Philadelphia, Richmond, St. Louis. ***Sales Offices:*** Atlanta, Houston.

Republic High Strength Bolts
HELP SPEED



Royal Oak Clarence Kimball High School, Royal Oak, Michigan.
Architects: Odell and Huelett and Luckemback.
General Contractor: O. W. Burke Company.
Structural Fabricator: Decroupet Iron Works Company.



CONNECTIONS ARE SWIFT AND SURE when Republic High Strength Structural Bolts are used in place of ordinary rivets. Steelwork goes up faster and better at less cost per installed fastener. Vise-like action of bolt gives maximum resistance to fatigue caused by dynamic loading.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

CLASSROOM CONSTRUCTION, WITH ECONOMY

Here's a suggestion to help you keep pace with the accelerating demand for classrooms. Specify Republic High Strength Bolts to speed structural-steel erection. Moreover, you'll secure lower cost per installed fastener in comparison to field-driven rivets.

These were the results attained in the Clarence Kimball High School, Royal Oak, Michigan, shown under construction on the opposite page. Steelwork, handled by Decroupet Iron Works Co., of Detroit, Michigan, was erected quickly and easily by two-man bolting crews. Old-fashioned riveting, requiring a heater and three riveters, was eliminated.

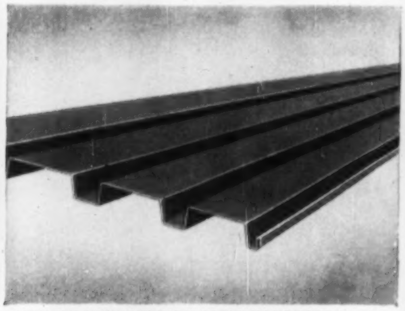
In addition to speed and economy of construction, you receive several other important benefits through use of Republic High Strength Structural Bolts.

For example, far greater joint strength is secured. High Strength Bolts are not only stronger than comparable rivets but exert a powerful clamp action when torqued tight. Forces normally carried in shear in the rivet are transmitted by friction through the structural members themselves.

Other advantages include increased safety through reduction of fire and accident hazards; reduced noise level through replacement of ear-splitting riveting guns by faster, quieter impact wrenches; and complete salvageability of structurals through elimination of torch-cutting disassembly when basic building rearrangements are necessary.

Get full information on savings, speed, strength, simplicity and safety made possible by Republic High Strength Bolt construction techniques. Simply call your Republic representative, or mail coupon today.

SAVINGS IN TIME AND MONEY are two major advantages you gain through use of Truscon Vision-Vent® Window Walls. Their use helps maintain construction and interior-finishing schedule in any weather. "U" factor is equivalent to masonry wall. Send coupon for facts.



NEW 24-INCH-WIDE TRUSCON FERROBORD® provides major time savings in roofing large areas. New design is available in lengths up to 32′ 6″. Straight lay means several crews can roof without delay. Can be welded directly to steel joists, working from above. 24-Inch Ferrobord is light, strong, fire-resistant.

TRUSCON "O-T" STEEL JOISTS give you predictable and dependable load-bearing capacity. Every Truscon "O-T" Joist — shortspan series — is quality protected. Each is backed by the Steel Joist Institute Seal of Approval. Be safe . . . avoid inferior quality. Specify approved Truscon "O-T" Steel Joists for lightweight, fire-resistant floor and roof support.

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Company________________________
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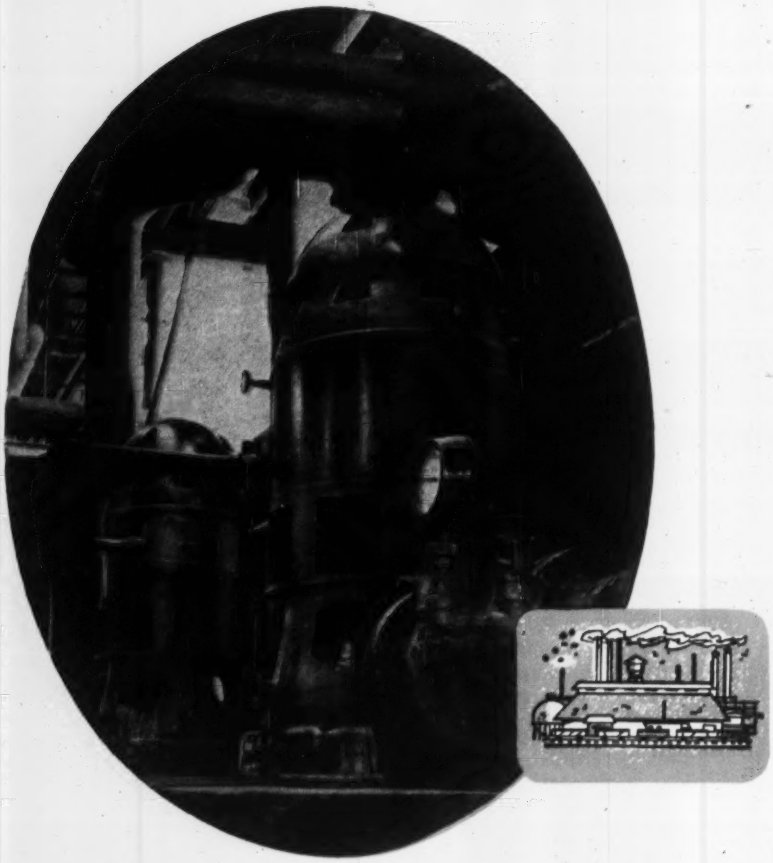
City____________Zone____State________



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At the Brea Chemical Company in Southern California two 50 HP Verti-Line process pumps are handling 1800 GPM at 105°F, returning water from the ammonia synthesis area to cooling towers. *These units have been operating 24 hours a day since May, 1954 – without maintenance expense other than normal service.*

Over 100,000 satisfied vertical pump users agree there's no pump like Verti-Line for low first cost, economical operation, and negligible maintenance.

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general offices & main plant
2943 VAIL AVENUE • LOS ANGELES 22, CALIFORNIA

LAYNE & BOWLER VERTI-LINE PUMPS

(*Continued from page* 18)

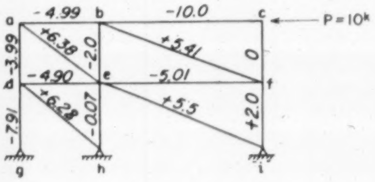
for pinned frameworks may be used.

If it is assumed that the horizontal members are relatively large compared with the diagonals then the relative horizontal deflection of the joints can be neglected.

According to this assumption the proportion of shear taken by ae = 0.658, and that by bf = 0.432.

With these preliminary stresses an approximation of the relative horizontal displacement of the joints can be made and a refined value of the shear distribution obtained.

An elastic analysis of the example structure gives the loads in each member as shown below.



From this elastic analysis the proportion of shear taken by ac = 0.498, and by bf = 0.502.

M. S. MacCalden, Jr.
Newtonville, Mass.

•

Sir—From the fact that $S = \frac{\Delta A E}{L}$ the short braces take about twice the load of the long braces. Accordingly, $\frac{2}{3}$P is taken by the short, and $\frac{P}{3}$ by the long braces.

Consequently, the vertical component of 2 long braces is

$$R_R = \frac{2\,\frac{P}{3}\,\frac{h}{2}}{2L} = \frac{Ph}{6L}$$

The vertical component of 2 short braces is

$$R_L = \frac{2\,\frac{2P}{3}\,\frac{h}{2}}{L} = \frac{2Ph}{3L}$$

and from $\Sigma V = O$

$$R_C = \frac{Ph}{2L}$$

Rudolph E. Leemhuis
Airfloor Company of Calif., Inc.
Norwalk, Calif.

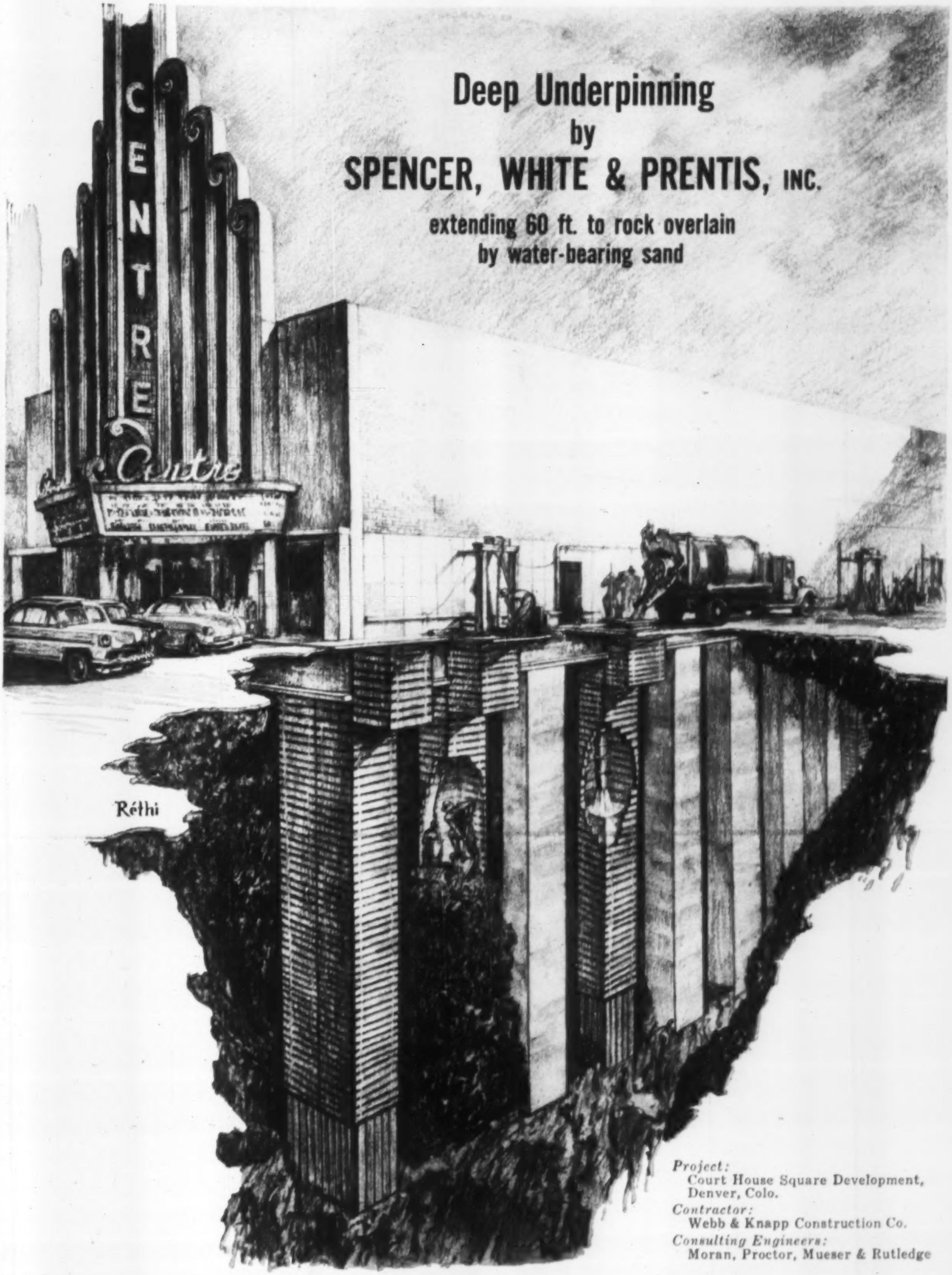
•

Sir—It is a principle of structural me-

(*Continued on page* 33)

Deep Underpinning
by
SPENCER, WHITE & PRENTIS, INC.

extending 60 ft. to rock overlain by water-bearing sand



Project:
Court House Square Development,
Denver, Colo.

Contractor:
Webb & Knapp Construction Co.

Consulting Engineers:
Moran, Proctor, Mueser & Rutledge

Spencer, White & Prentis, Inc., 10 East 40th St., New York 16, N. Y. • Detroit • Chicago • Washington • Canada

Greenville, S.C. Builds for 1990 with CLAY PIPE

The new sewerage program now underway in Greenville looks far into the future of this fast-expanding area. Existing main and outfall sewers are being paralleled by larger ones designed to serve the community until 1990, or until the present 130,000 population has grown to 233,000. Greenville is following the pattern of hundreds of other cities which are building for the future by specifying the *guaranteed* pipe—Vitrified Clay. The total project will cost $3,500,000.

"Because of the character of the wastes handled and expected to be handled by the sewers," reports Superintendent E. D. Fry of the Greater Greenville Sewer District Commission, "it is the policy of the Commission to use Vitrified Clay Pipe wherever possible and to require it to be used by the subdivisions of the sewer district." Clay Pipe is the *only* pipe that *never wears out.*

Consulting Engineers—**Wideman and Singleton**
Contractors—**A. H. Guion & Co., Peden Construction Co., Glenn Construction Co.**
Greater Greenville Sewer District Commission—**E. D. Fry, Supt.**

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PIPE

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C-861-2

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Dig Them In The Dry With A Moretrench Wellpoint System

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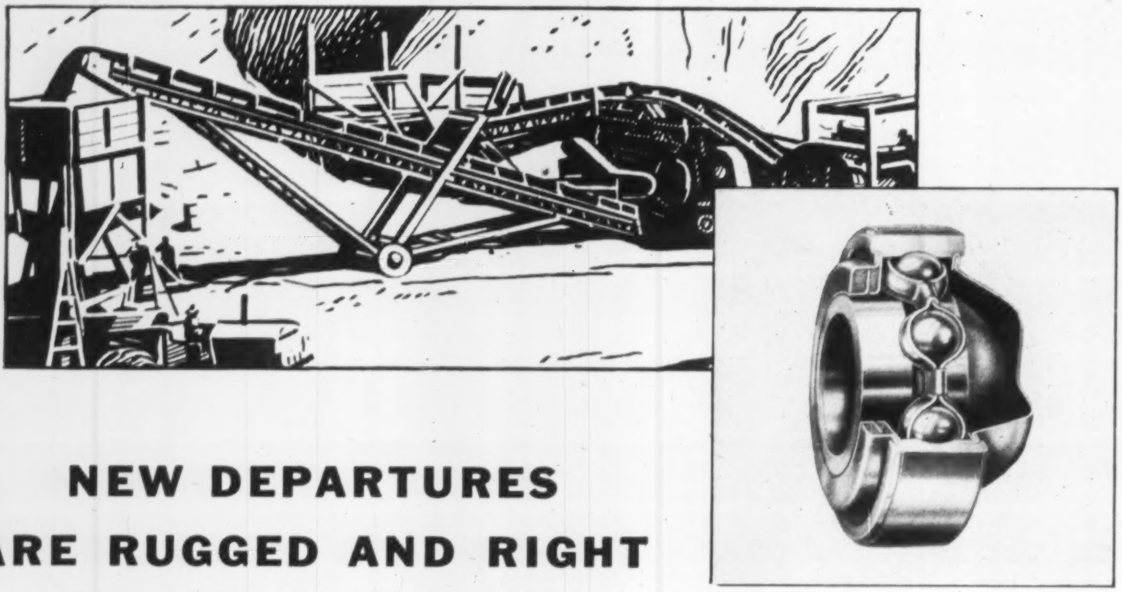
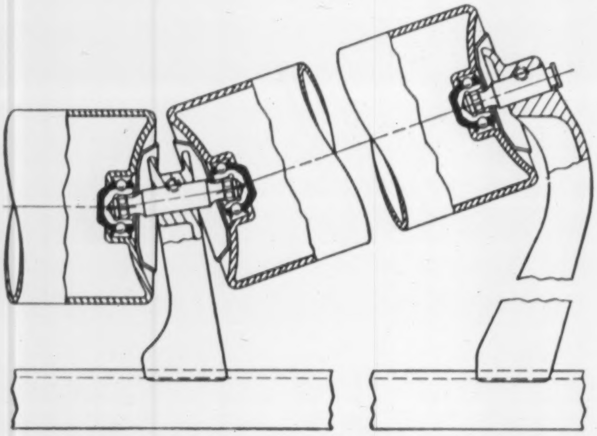
New Jersey

Western Representative: Andrews Machinery of Washington, Inc., Seattle 4, Washington
Canadian Representative: Geo. W. CROTHERS Limited, Toronto, Ontario
Brazilian Representative: Oscar Taves & Co., Ltd., Rio de Janeiro

ND FACTS



NEW DEPARTURES ARE RUGGED AND RIGHT FOR CONSTRUCTION WORK!



New Departure's time-proven conveyor bearings give users of portable construction equipment simple design, easy assembly in the field, and virtually zero maintenance.

Conveyor roll units built around these bearings require remarkably few parts. Bearing CB-504, shown here, uses short, easily removable stub shafts allowing self-aligning motion, yet preventing the inner ring from turning. Assembly is quick and easy . . . by anyone who can handle a wrench.

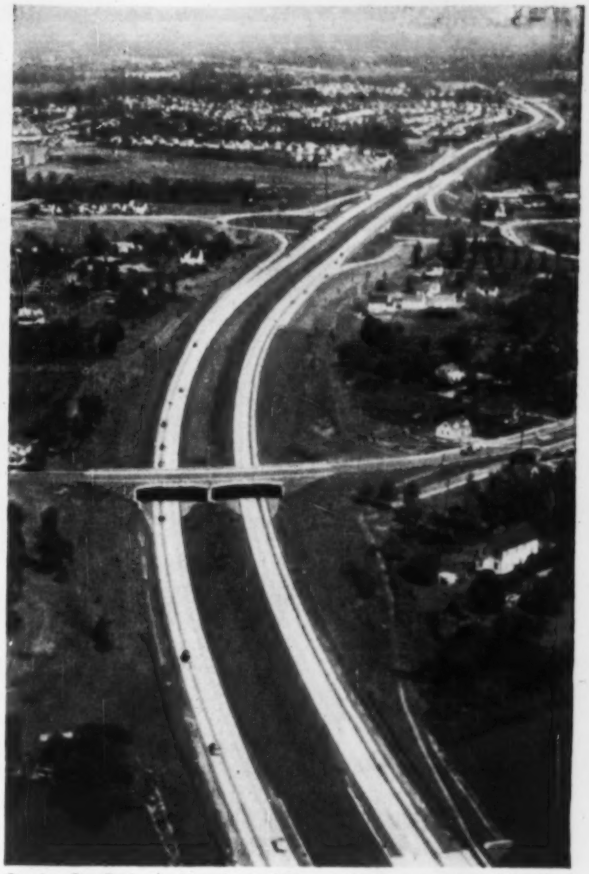
These bearings do away with lubricating fittings, grease piping, springs or adjusting devices. They are sealed and lubricated-for-life, eliminating expense of labor and lubricants in the field. And there's never a need for adjustment.

Write today for New Departure's catalog "Lubricated-for-Life Ball Bearings for Conveyor Systems."

Genuine simplicity is the feature of conveyors built around New Departure's Type CB-504 ball bearing.

NEW DEPARTURE
DIVISION OF GENERAL MOTORS, BRISTOL, CONN.
NOTHING ROLLS LIKE A BALL

Here Thor rock drills are on the job speeding shooting of oversizes that power shovels can't handle. Thor's No. 75 rock drill is capable of sinking holes up to 20 ft. in the hardest rock. This heavy duty work horse means fast footage in either wet or dry secondary drilling. Retainer locks steels for safety.



Garden City Parkway, New Jersey joins eastern shore resorts and the New York metropolitan areas—exemplifies the new Interstate Superhighway System. 41 thousand miles of such highways have yet to be built. Powerful Thor rock drills will be on the job helping to clear the way economically.

Thor Rock Drills ready to meet

THE $27 BILLION CHALLENGE

For highway, skyway, freeway or expressway —you'll drill the fastest way the Thor way.

Thor's big red rock drills already spot the nation where state projects are under way—clearing the way for the 41,000 miles of expressways to be built at a cost of $27 billion.

Here are the features which put Thor rock drills at the top-of-the-rock. Controlled power—Thor's exclusive tubular air valve admits only the exact amount of air required, assuring maximum air economy, low maintenance cost and smooth performance. Renewable chuck bushing reduces replacement costs and minimizes steel breakage and damage to piston hammer. Automatic lubrication.

Ask your Thor distributor to demonstrate Thor's complete line of rock drills. Thor Power Tool Company, Prudential Plaza, Chicago 1, Illinois.

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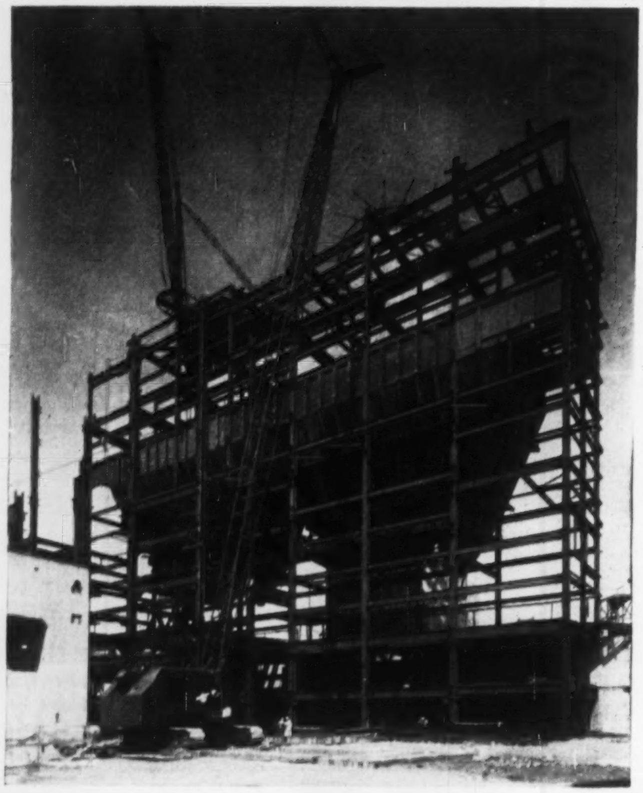
THOR POWER TOOL CO., CHICAGO

From INGALLS **More Power to You!**

Through the Strength and Economy of Fabricated Steel



Public Service Company of Indiana, Inc. New Albany Power Station Units #1 and #2 at Publico, Indiana.

ARCHITECTS & ENGINEERS: Sargent & Lundy **CONTRACTOR:** Gust K. Newberry Company, New Albany, Ind. **STEEL FABRICATION:** The Ingalls Iron Works Company **STEEL ERECTION:** The Ingalls Steel Construction Company

STEEL PLATE FABRICATORS ASSOCIATION FOUNDED 1933

AMERICAN INSTITUTE OF STEEL CONSTRUCTION INC. AISC FOUNDED 1921

The Ingalls Iron Works Company was selected by the Public Service Company of Indiana, Inc. to fabricate the steel for Units #1 and #2 of the New Albany Power Station at Publico, Indiana. The Ingalls Steel Construction Company is handling its erection.

Ingalls' skill, ability and experience with fabricated steel for power plants have served in the construction programs of 46 of the nation's leading power companies . . . programs designed to meet the ever-increasing demand for more power.

These power plants, as well as thousands of other industrial and commercial buildings, are proof of Ingalls' ability to meet all requirements for the strength and economy of structural steel . . . with both fabrication and erection!

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(Continued from page 26)

chanics that the various elements of an indeterminate structure are stressed in proportion to their stiffness. Since no member sizes are shown for the given bent there is no way of telling which method is "more nearly correct". If more complete information were available, classical methods could easily be used to give a solution. Any of the four methods given, since none of them takes stiffness into account, could by coincidence give the correct answer.

In structural problems of this type the engineer must use his training, experience and judgment to decide whether or not the problem justifies a rigorous solution. If it does not he must then use an approximate method to proportion the stresses. Any method that accomplishes this result to the desired degree of accuracy is applicable.

RALPH M. BAUMARTEN
Jackson Heights, N. Y.

•

SIR—The method of distributing shears according to the cosine times the area of the bracing member is the most logical, providing the two braced bays are adjacent to each other and the beams and columns are appreciably stiffer than the braces.

In small riveted structures, the errors in fabrication and joint slippage detract from the accuracy of a more rigorous elastic analysis.

For relatively small loads or where a very rigid structure is desired, it may be assumed that all the shear is taken by the first brace and the second one may be designed nominally or for some stress reversal.

ALVIN FISCHER
Structural Engineer
Greenhut & Taffel
New York, N. Y.

Electronics Scale Debate

The con . .

Sir—In view of the extensive experience of the Fairbanks, Mores & Co. in manufacturing both mechanical and electronic weighing equipment, there are many things in the article "How Do Electronic Scales Stack Up" by James Heatley (ENR June 20, p. 39) which experience leads us to question.

The article states that electronic load cell equipment guaranteed to 1/20 of 1% accuracy of the applied load has been used for years in the aircraft weighing industry and that it is not the practice to guarantee standard mechanical models to such a fine degree of accuracy.

We seriously question the article's

(Continued on page 40)

Introducing
Presto SEAL
Vitrified
Clay Pipe
"it joints like magic"

Here's big news for cost-conscious sewage and waste disposal architects, engineers and contractors. KAUL, for over 50 years a leading manufacturer of vitrified clay products, scoops the field with a completely revolutionary pipe that literally "joints like magic." Appropriately identified as Presto SEAL, this time and labor-saver affords a completely leak-proof, root-proof and corrosive-proof joint that lasts—not for years . . . not for life . . . but positively FOREVER! It's flexible, regardless of temperature . . . permits a 3" deviation from center line without breaking the seal . . . is tested to withstand the most rigid infiltration-exfiltration requirements. And, get this—KAUL Presto-SEAL pipe is available in a full range of pipe and fitting sizes . . . from 4" to 36", in both standard and extra strength.

Ease of installation, permanence and flexibility, economical in use . . . these are factors which are making Presto-SEAL pipe by KAUL first choice for better sewer lines everywhere. Let us prove it.

Write for complete facts,
including descriptive Bulletin PS-100—
or contact your KAUL representative today.

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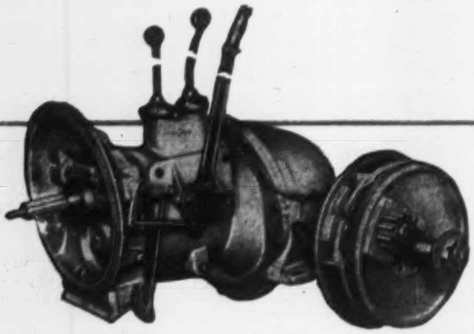
THE KAUL CLAY
MANUFACTURING COMPANY
TORONTO, OHIO U. S. A.



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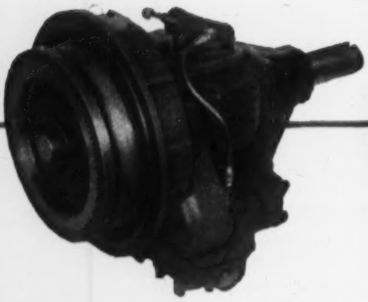

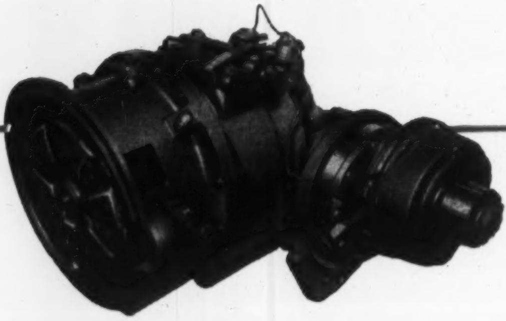

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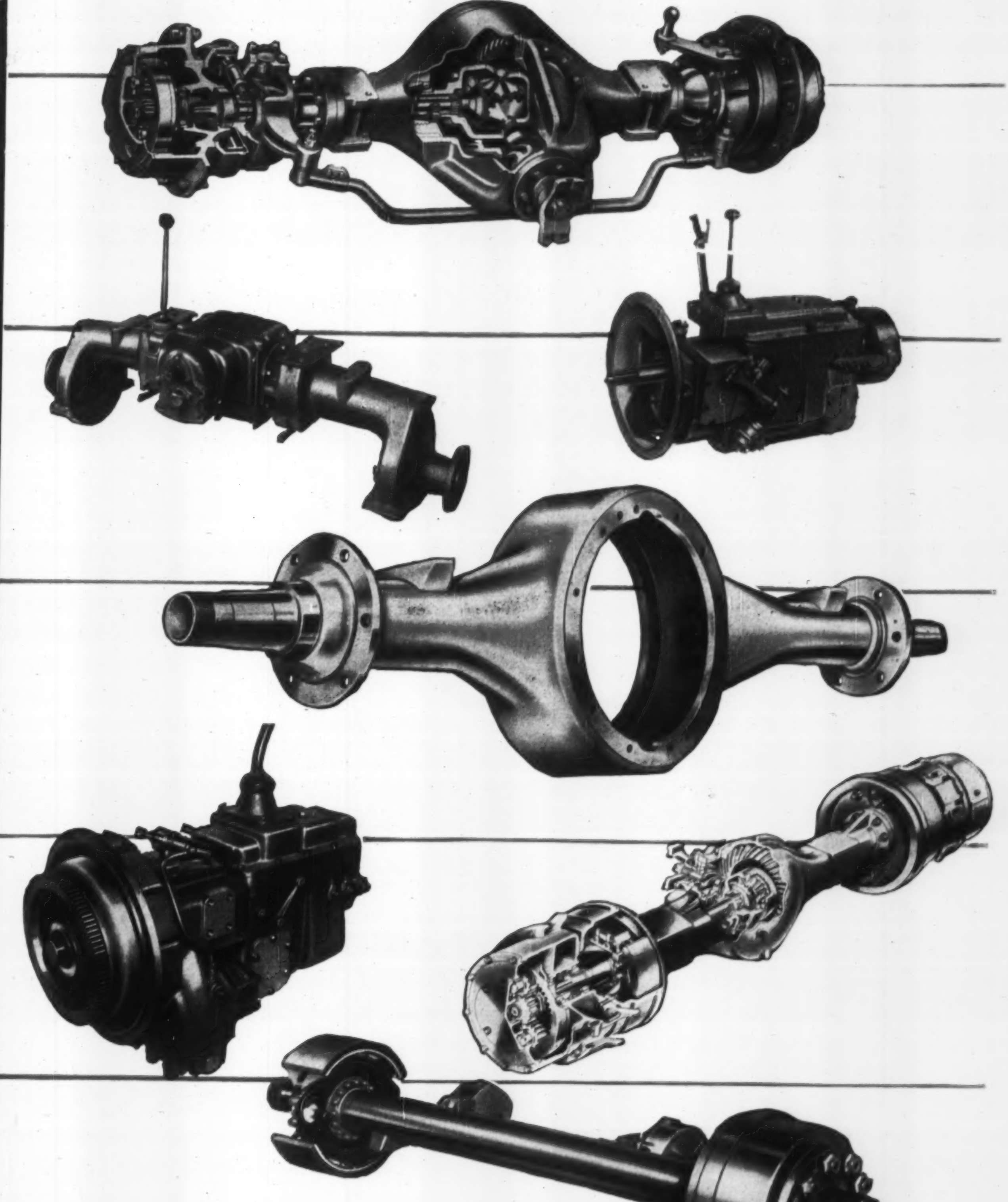

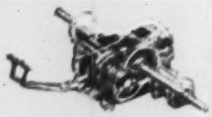

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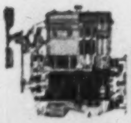

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High-turbulence, high-compression engine built to exceed toughest industrial demands.

INDEPENDENT PUMP

Runs at constant engine speed, at any ground speed, in any gear, independent of clutch or transmission. Integral design, capacity range for all jobs.

11-YD. SCRAPERS—Come along fast with Minneapolis-Moline GB Diesel Wheelers out front. Here's big-scale production at new low equipment cost, in operating cost, and a new high in dependability.

OUTWORK-

anything else in their class!

AMPLI-TORC TRANSMISSION

Gives you 10 speeds forward, 2 reverse. One-lever control boosts pull-power 90%, cuts ground speed 45% on the go—no stopping, no shifting.

MM BUILT-IN POWER STEERING—Drive the tough jobs as if you're on the highway . . . power steering is *built-in*, protected from external damages.

MM
MINNEAPOLIS-MOLINE

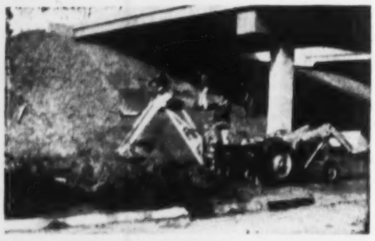
THE GOLDEN POWER LINE

WHEELERS

That sleek, *POWERLINE* look of a Minneapolis-Moline Wheeler is more than surface streamlining—underneath is power and stamina to make eyes pop and job costs tumble! Never has so much sheer *workpower* been built into one tractor! Here's *engine power* to doze and load; *PTO power* that comes straight from the crankshaft; *constant-running hydraulic power* for 3-point hitch or remote cylinders. Most important, that world of power is built for sheer brute strength that's *meant* to absorb punishment with long-life service.

Ask your MM Dealer to demonstrate the money-saving, money-making advantages of the seven great Wheelers of the Golden Power Line!

MINNEAPOLIS-MOLINE MINNEAPOLIS 1, MINNESOTA
INDUSTRIAL POWER DIVISION

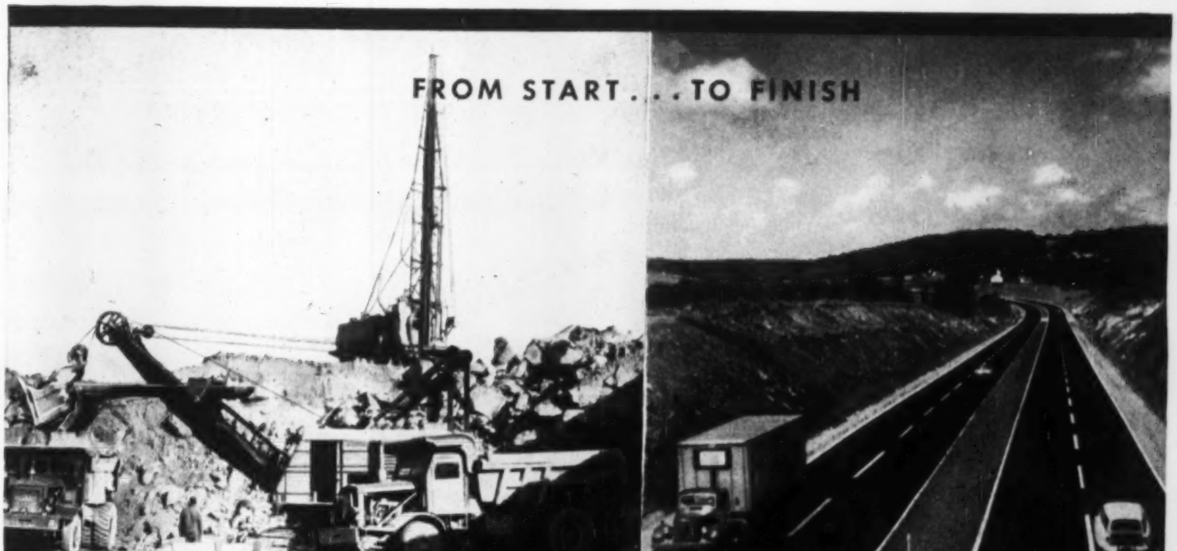


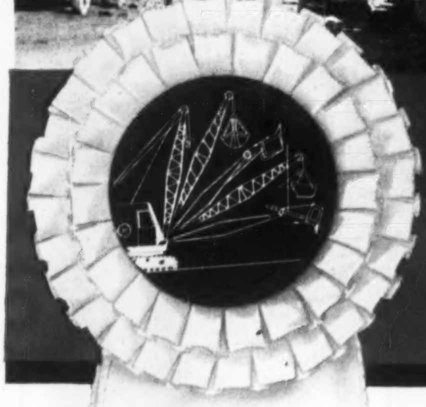
335 INDUSTRIAL WHEELER—Here's the unit that gives you big work-power (47 engine bhp) to cut your costs on all jobs that call for a highly maneuverable industrial-type tractor.

445 INDUSTRIAL WHEELER — This Industrial Wheeler delivers 57 engine bhp to outwork anything else in its power size. Factory-equipped to utilize gasoline, LP gas, or Diesel fuels.

445 UTILITY WHEELER—Here's speed, traction, and compaction. This MM 445 Wheeler puts Ampli-Torc to work, boosts pull power 90% without stopping or shifting.

UTIL WHEELER offers 6 forward and 6 reverse speeds with exclusive shuttle gear . . . makes material handling jobs go fast and smooth. When bucket equipped, handles capacities up to 1¼-yd. struck.





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STAY AHEAD OF JOB SCHEDULES!

Contractor PM System Includes:

1. Record Folder—provides identifying data for each piece of equipment, holds equipment records.
2. Operator's Recommendation Chart—lists the correct lubrication recommendations for each piece of equipment.
3. Weekly Service & Inspection Report—an up-to-date record of mechanical condition of equipment, work to be done or completed.
4. Delivery Ticket—lists petroleum supplies delivered to equipment on the job.
5. "Squawk" Sheet—used by equipment operator to point out trouble spots that need attention.

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SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

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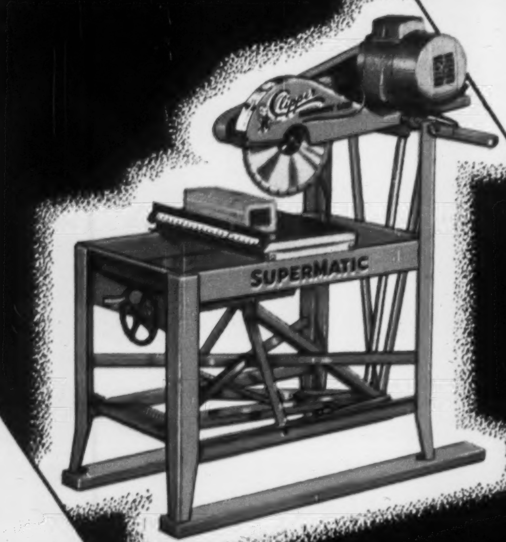

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WITH

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NO HEAD ANGLE ADJUSTMENTS TO MAKE CUTTING HEAD IS INSTANTLY POSITIONED READY TO CUT AT ANY HEIGHT 0" TO 17"

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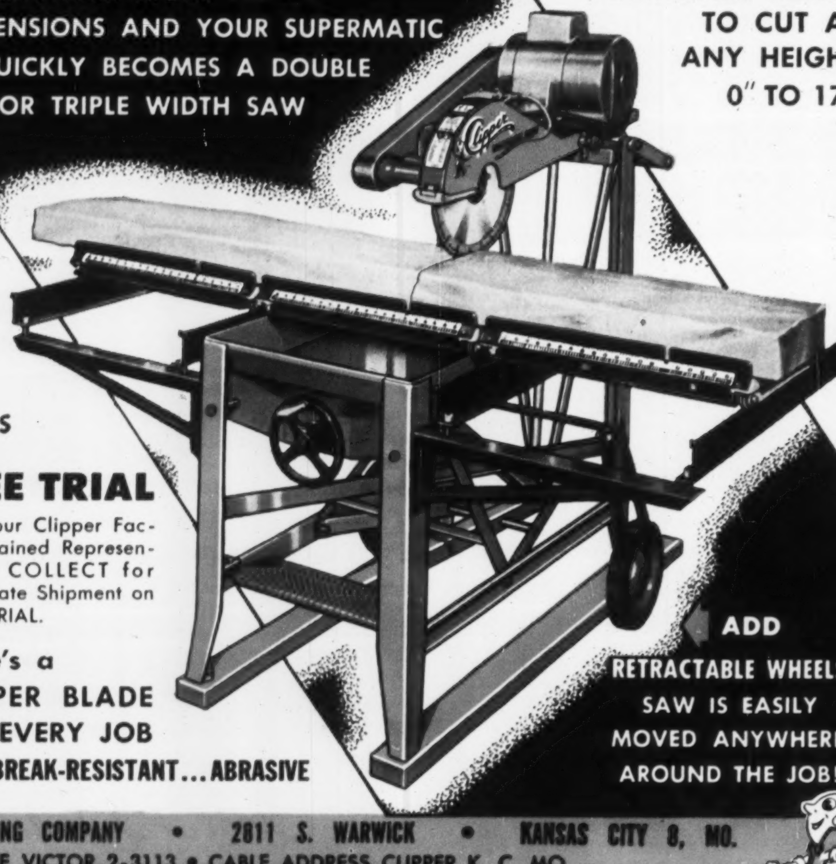

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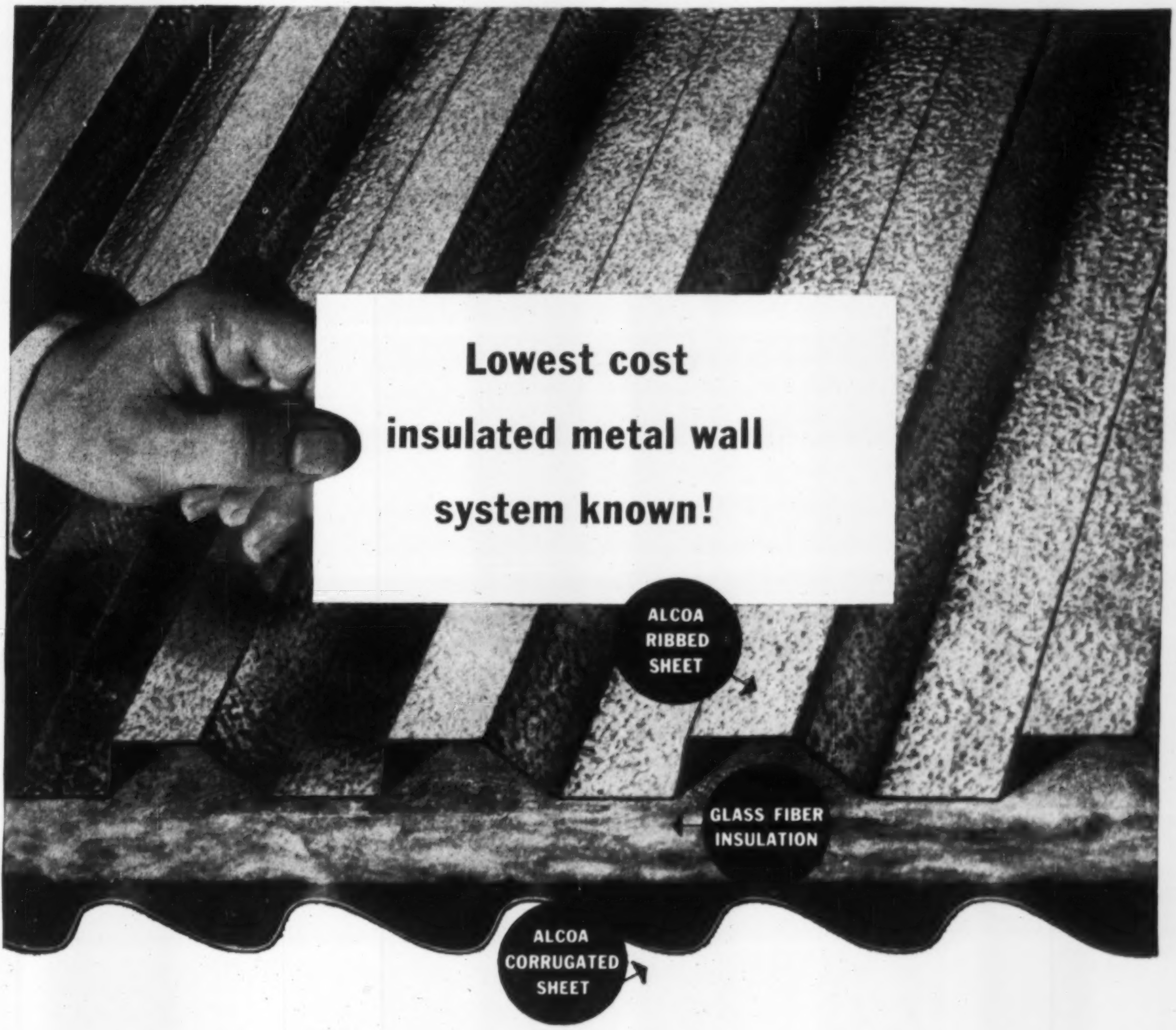
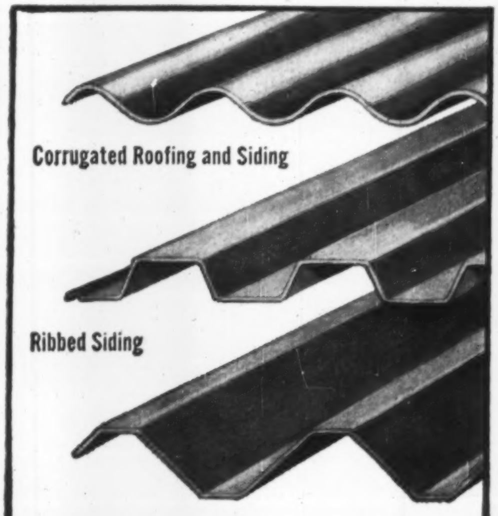

Lowest cost insulated metal wall system known!
ALCOA RIBBED SHEET
GLASS FIBER INSULATION
ALCOA CORRUGATED SHEET


Corrugated Roofing and Siding
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Sandwich wall of Alcoa® Aluminum is the lowest cost insulated metal wall system known. It's available in three attractive and practical facings—ribbed, corrugated and V-Beam. Natural finish or embossed.

With sandwich wall of one-inch glass fiber insulation, you get three times the insulating value of eight-inch masonry. Its exceptional light weight means lighter framing. Once structurals are up, your building can be enclosed fast. And with Alcoa Aluminum, you know you have built-in corrosion resistance that will eliminate maintenance costs for years to come.

Specify sandwich wall of Alcoa Aluminum and save money for your clients. Complete data available from your nearest Alcoa sales office or Alcoa Approved Applicator. Or write Aluminum Company of America, 860-K Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

NEW!
"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

ALCOA
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INDUSTRIAL BUILDING PRODUCTS
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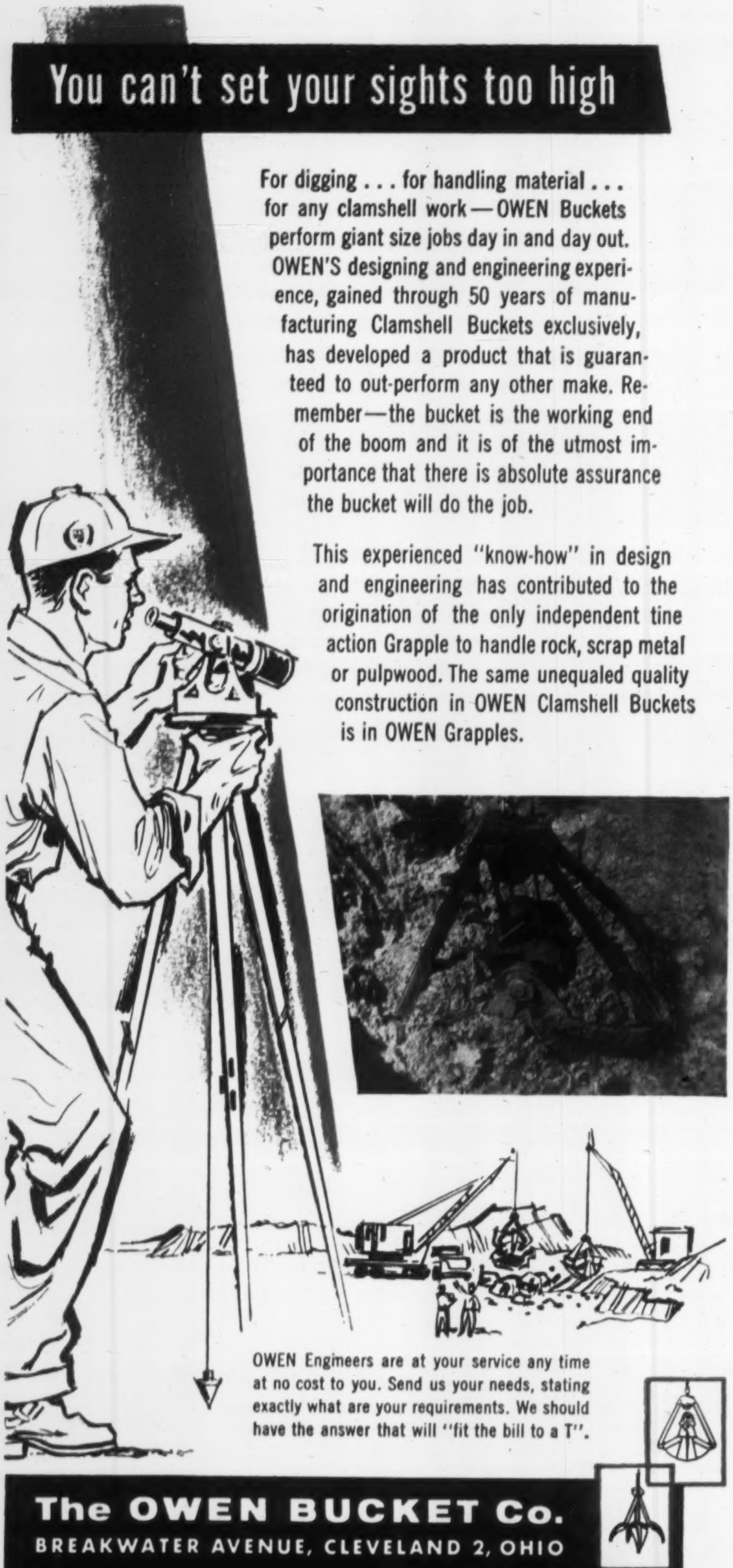


You can't set your sights too high

For digging . . . for handling material . . . for any clamshell work — OWEN Buckets perform giant size jobs day in and day out. OWEN'S designing and engineering experience, gained through 50 years of manufacturing Clamshell Buckets exclusively, has developed a product that is guaranteed to out-perform any other make. Remember — the bucket is the working end of the boom and it is of the utmost importance that there is absolute assurance the bucket will do the job.

This experienced "know-how" in design and engineering has contributed to the origination of the only independent tine action Grapple to handle rock, scrap metal or pulpwood. The same unequaled quality construction in OWEN Clamshell Buckets is in OWEN Grapples.

OWEN Engineers are at your service any time at no cost to you. Send us your needs, stating exactly what are your requirements. We should have the answer that will "fit the bill to a T".

The OWEN BUCKET Co.
BREAKWATER AVENUE, CLEVELAND 2, OHIO
BRANCHES: New York • Philadelphia • Chicago
Berkeley, Calif. • Fort Lauderdale, Fla.

. . . Reader Comment

(*Continued from page 33*)

accuracy claims for electronic weighing. Many standard mechanical scales are in use today with accuracies far exceeding 1/20 of 1% of the applied load. It is difficult to justify the electronic claim when it is a known fact that the load receiving elements are only guaranteed to an accuracy of 1/10 of 1% of the total capacity and the instrumentation needed to transfer the signal from load receiving element to a readable weight further reduces this accuracy.

We also question the statement that two electronic scales for motor truck weighing have been sealed in Minnesota under the requirements of the law to 1/20 of 1%. Of course, they do not state whether this is of total scale capacity or applied load. It might be possible to do this on a low capacity scale but it is doubtful if it can be done on the popular 50-ton sizes.

Some statements on the abilities of the load cell are made which tend to make the reader believe that in comparison to mechanical scales, there is little or no wear, and weather condition have no effect. This is not so. To begin with, the load cell itself is the same principle as a spring with the exception that instead of using a coiled steel member, a solid steel column is used. When a load is placed on this column, it is compressed the same as a coiled member. When the load is removed, it theoretically returns to its original position the same as a coiled member.

It is a basic law that springs are affected by temperature and moisture. This is not true in a knife edge scale. Electronic type of weighing uses the pull of gravity to compress a spring member. Mechanical scales use the pull of gravity to offset the pull of gravity and is not dependent on the idiosyncrasies of manufactured metal to the same degree as springs. In spite of the fact that load cells used in electronic weighing are said to be hermetically sealed, moisture is one of the greatest enemies of these units, and no cell manufacturer will give an unconditional guarantee on cells installed where any great amount of moisture is present.

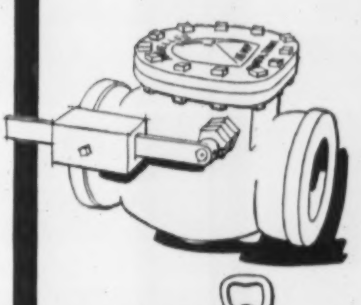
The article's author points out that failure of pit components on electronic scales would require a far higher percentage of first cost on replacement than on mechanical scales. He failed to point out that pit component failures on electronic scales are much more frequent than on mechanical scales.

The author brought up the fact

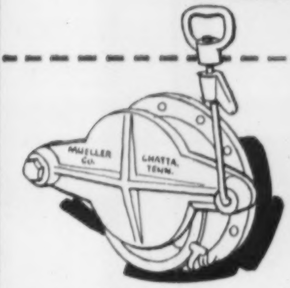
(*Continued on page 46*)

MUELLER® plant valves

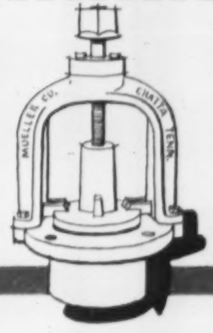
Check Valves For vertical or horizontal position, iron-body, fully bronze-mounted. Hub, flanged or screwed ends. Bronze seat ring with bronze or rubber disc ring. Swing-type; swing-type with lever and weight; or swing-type with lever and spring. 175 p.s.i. working pressure on valves through 12", 150 p.s.i. working pressure on valves 14" through 20". All sizes have 300 p.s.i. test pressure. Underwriters Laboratories and Associated Factory Mutual Laboratories approved also available.

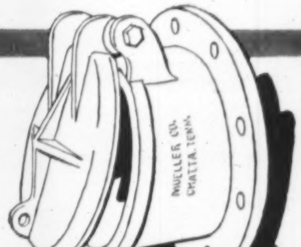


Shear Gates Iron body, bronze seat ring and disc ring. Flanged, hub or spigot frame. Sizes from 4" through 24". Furnished with 2' lift handle and catch. Gate latches 30° below horizontal. This design permits full opening of gate – no obstruction of orifice.



Mud Valves Iron body, bronze disc ring, seat ring and stem. Flanged or spigot frame with non-rising stem – sizes 3" through 24". Flanged or spigot frame with rising stem – sizes 4" through 18". Available with 2" wrench nut, handwheel or extension stem.





Flap Valves
Iron body, bronze seat ring and disc ring. Flanged, hub or spigot frame. Sizes from 4" through 24".

Various types of handwheel and geared floor stands, extension stems, chain and sprocket wheels, stem guides and indicator posts are available for any type of installation.

Consult your Mueller Representative
or write direct for complete information.

MUELLER CO. **CHATTANOOGA, TENN.**

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100th YEAR SERVING the Water and Gas Industries

Since 1857

ENR Construction and Building Cost Indexes Show The 8-year cost rise and forecast a continuing uptrend

CONSTRUCTION COST TRENDS 1913-1957
as measured by the
ENGINEERING NEWS-RECORD COST INDEXES

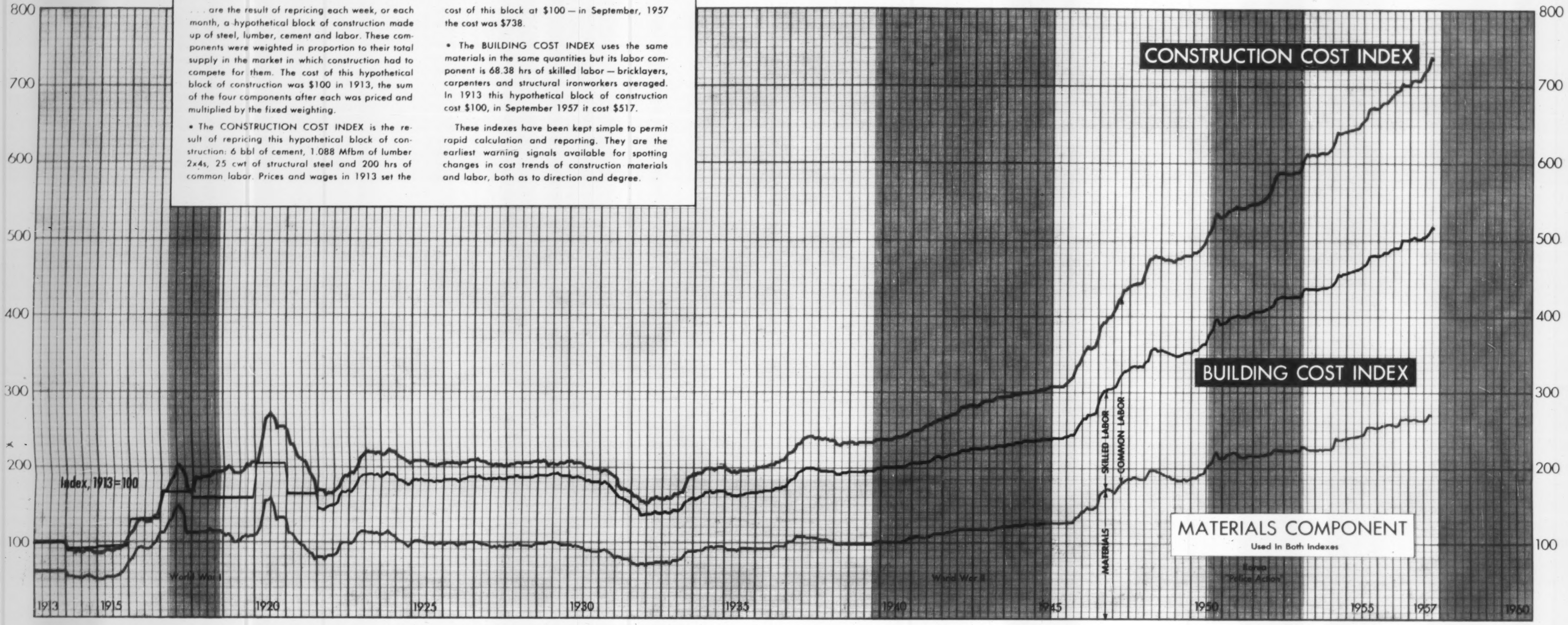
The Engineering News-Record Construction and Building Cost Indexes

. . . are the result of repricing each week, or each month, a hypothetical block of construction made up of steel, lumber, cement and labor. These components were weighted in proportion to their total supply in the market in which construction had to compete for them. The cost of this hypothetical block of construction was $100 in 1913, the sum of the four components after each was priced and multiplied by the fixed weighting.

• The CONSTRUCTION COST INDEX is the result of repricing this hypothetical block of construction: 6 bbl of cement, 1.088 Mfbm of lumber 2x4s, 25 cwt of structural steel and 200 hrs of common labor. Prices and wages in 1913 set the cost of this block at $100 — in September, 1957 the cost was $738.

• The BUILDING COST INDEX uses the same materials in the same quantities but its labor component is 68.38 hrs of skilled labor — bricklayers, carpenters and structural ironworkers averaged. In 1913 this hypothetical block of construction cost $100, in September 1957 it cost $517.

These indexes have been kept simple to permit rapid calculation and reporting. They are the earliest warning signals available for spotting changes in cost trends of construction materials and labor, both as to direction and degree.



THE ENGINEERING NEWS-RECORD Construction Cost Index was established in 1921, based on price movements in structural steel, Portland cement, lumber and common labor. The Building Cost Index was introduced in 1938 to measure also the effect of skilled wage trends on costs. It uses the same materials as those in the Construction Cost Index but skilled labor, instead of common labor.

A few minor changes have been made in these indexes over the years necessitated by changed conditions in the market. These are recorded in full in ENR, September 1, 1949, page 398, together with a complete history of the development and use of these indexes. New values originally reported monthly at the beginning of each month have also been reported each week beginning July, 1954.

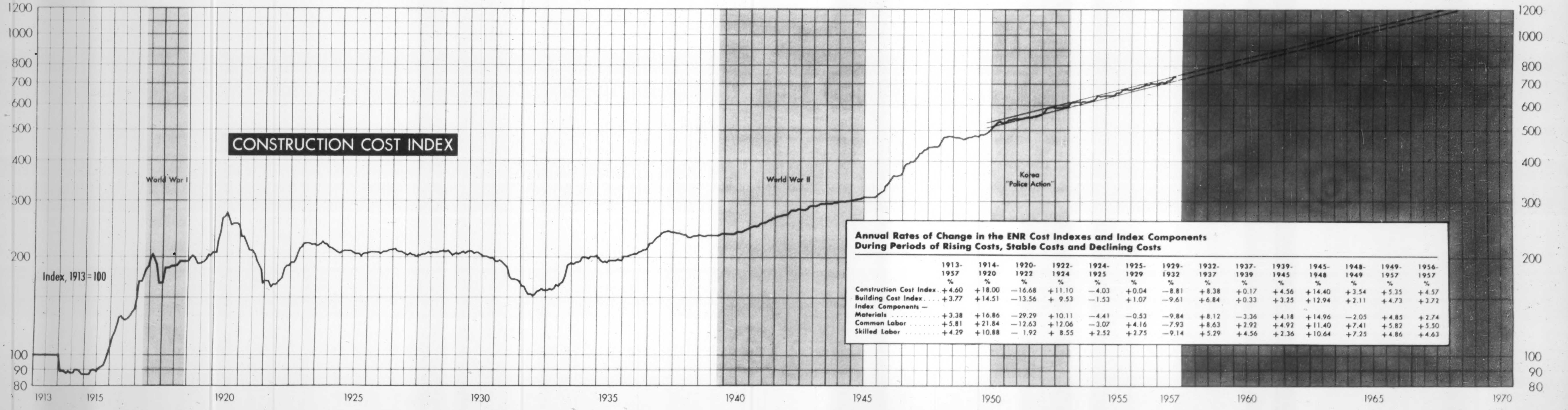
Both indexes are based on 1913=100 but are reported also each week on a 1949=100 base. These are weighted aggregate indexes, thus base years can be shifted at will. Conversion factors for shifting to other base years most commonly used are shown in the pages of this Annual Cost Issue of ENR.

ENR Construction and Building Cost Indexes reflect wage rate and materials price trends. Wages include fringe benefits such as health and welfare, pension and vacation fund contributions paid by contractors. The Indexes do not adjust for labor or job efficiency, materials availability, competitive conditions, management, mechanization or other "intangibles" affecting construction costs.

Both Indexes have proved, over the years, infallible as to direction and, in normal times, accurate as to degree. Under abnormal conditions of increasing or decreasing job productivity, allowance for the "intangibles" listed above should be made in measuring the degree of change in overall completion costs, or in construction selling price trends.

Supplement to Engineering News-Record, October 17, 1957. Business News Department, Engineering News-Record, P.O. Box 89, Times Square Station, New York 36, N. Y. Reprints are available at $1.00 each.

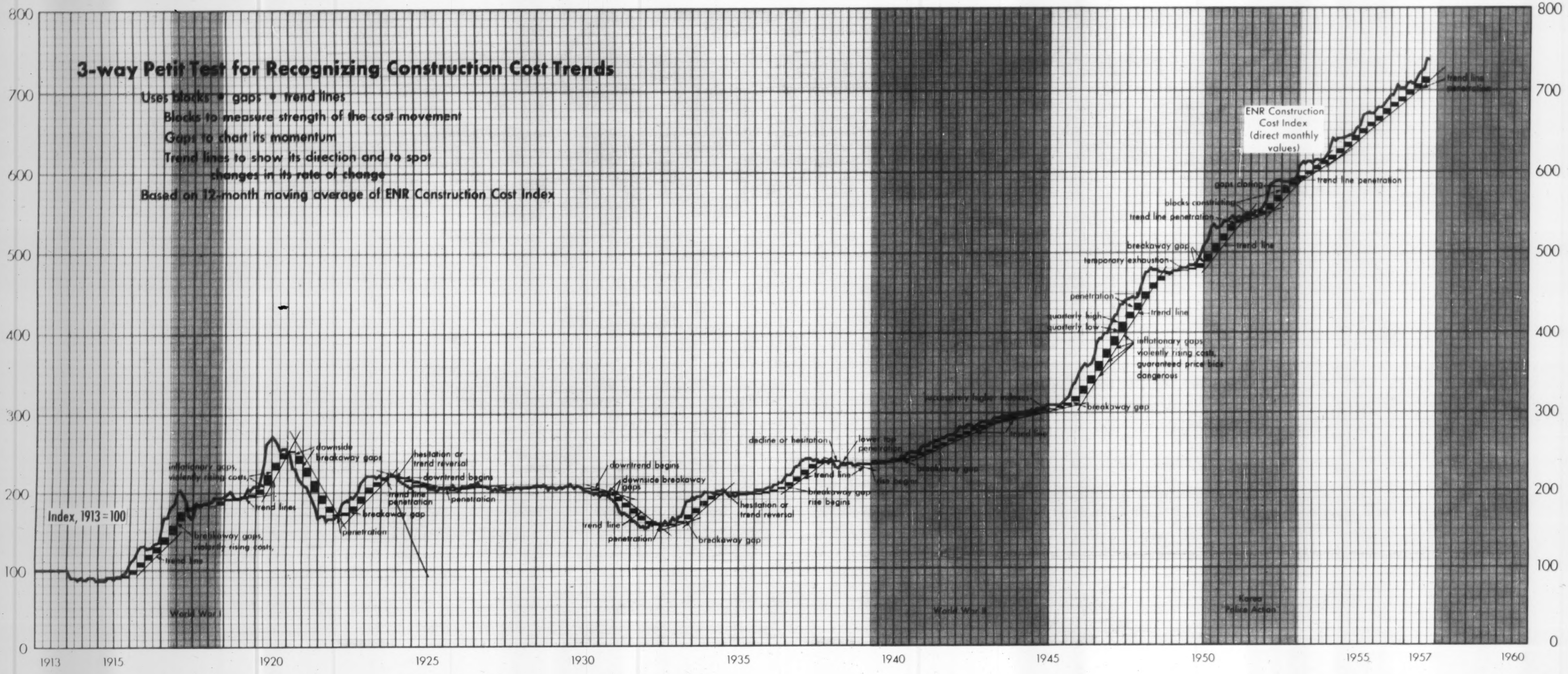
But at a slower rate — the Construction Cost Index plotted on a semi-logarithmic scale



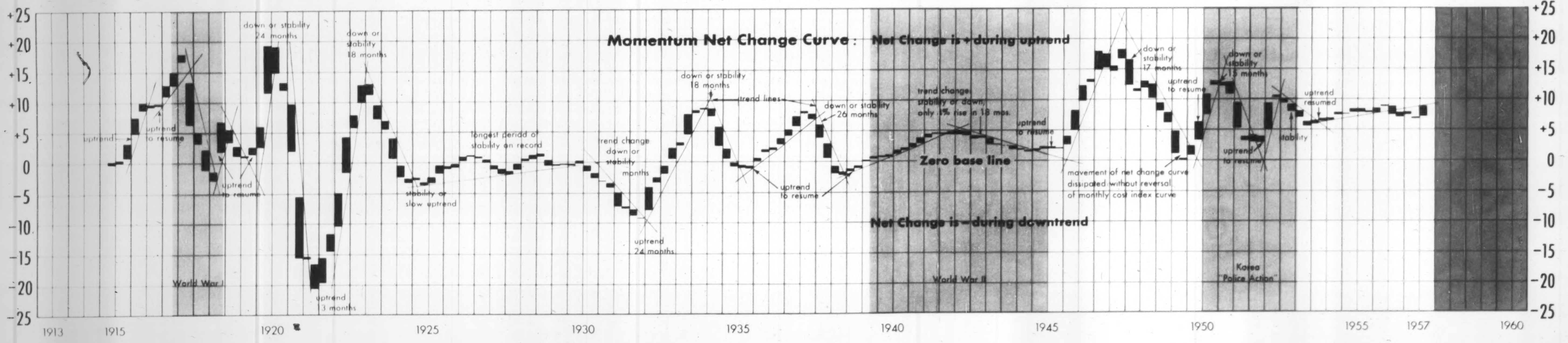
Annual Rates of Change in the ENR Cost Indexes and Index Components During Periods of Rising Costs, Stable Costs and Declining Costs

	1913-1957 %	1914-1920 %	1920-1922 %	1922-1924 %	1924-1925 %	1925-1929 %	1929-1932 %	1932-1937 %	1937-1939 %	1939-1945 %	1945-1948 %	1948-1949 %	1949-1957 %	1956-1957 %
Construction Cost Index	+4.60	+18.00	−16.68	+11.10	−4.03	+0.04	−8.81	+8.38	+0.17	+4.56	+14.40	+3.54	+5.35	+4.57
Building Cost Index	+3.77	+14.51	−13.56	+ 9.53	−1.53	+1.07	−9.61	+6.84	+0.33	+3.25	+12.94	+2.11	+4.73	+3.72
Index Components —														
Materials	+3.38	+16.86	−29.29	+10.11	−4.41	−0.53	−9.84	+8.12	−3.36	+4.18	+14.96	−2.05	+4.85	+2.74
Common Labor	+5.81	+21.84	−12.63	+12.06	−3.07	+4.16	−7.93	+8.63	+2.92	+4.92	+11.40	+7.41	+5.82	+5.50
Skilled Labor	+4.29	+10.88	− 1.92	+ 8.55	+2.52	+2.75	−9.14	+5.29	+4.56	+2.36	+10.64	+7.25	+4.86	+4.63

With no turning point or reversal now in sight — using the George H. Petit Trend Recognition method of interpreting quarterly range of 12-months moving average



But the momentum of the cost rise is slowing as measured by the Petit Method of using the quarterly range of the difference between the 12-months moving average for the current month and for the third month previous.



RECOGNIZING COST TRENDS AND FORECASTING TURNING POINTS

THE RATE OF CHANGE IN COSTS during short or long-term trends is evident when the ENR Construction Cost Index is plotted on a semi-logarithmic scale as in the chart above. This chart shows that since 1949 costs have increased at nearly a constant rate averaging 5.5% per year compounded annually.

Although 1957 brought a slower rate of increase, 4.6%, than the average rise during the preceding seven years 1950-56, the latest rise is greater than in 1956. This is because common labor unions won substantially larger wage increases this year than last.

There is so far no evidence that the eight-year rise in costs is approaching a turning point. Deferred wage increases provided by long-term contracts signed by unions in '57 insure future annual wage hikes in 1958, 1959 and in one of the 20 Cities as far ahead as 1961. Details of these increases are described in the Labor Cost section of this Annual Cost Issue of ENR.

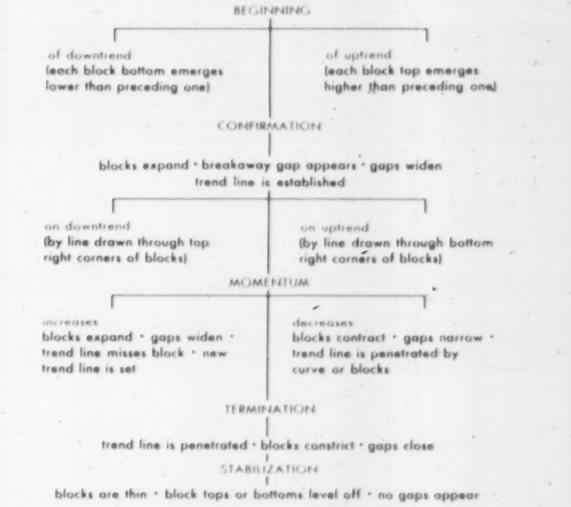
Rising labor costs have also contributed to increases in materials prices. This trend is likely to continue, particularly in steel and cement prices.

STRENGTH AND MOMENTUM OF COST TRENDS are measured by the chart at the left. This method of analysing the cost outlook developed by George H. Petit, was introduced to ENR readers September 4, 1952, page 98, with a full discussion of the historical turning points recorded by the ENR Construction Cost Index.

Mr. Petit computes the 12-months moving average of the Index to iron out monthly ups and downs and reveal the annual trend. This removes the seasonal effects of wage and steel price changes which have occurred at corresponding periods each year. The moving average is plotted at the 12th month. The blocks are formed by the low and the high moving average in each quarter.

How to recognize the trends indicated by these blocks, gaps and trend lines is shown in the following diagram.

How to recognize and interpret stages in cost trend cycles:


BEGINNING

of downtrend
(each block bottom emerges lower than preceding one)

of uptrend
(each block top emerges higher than preceding one)

CONFIRMATION

blocks expand • breakaway gap appears • gaps widen
trend line is established

on downtrend
(by line drawn through top right corners of blocks)

on uptrend
(by line drawn through bottom right corners of blocks)

MOMENTUM

increases
blocks expand • gaps widen • trend line misses block • new trend line is set

decreases
blocks contract • gaps narrow • trend line is penetrated by curve or blocks

TERMINATION

trend line is penetrated • blocks constrict • gaps close

STABILIZATION

blocks are thin • block tops or bottoms level off • no gaps appear

All three indicators must be in agreement
for positive confirmation of trend

In determining major changes or turning points in the cost trend, the reader should heed the warning by Mr. Petit: "All three 'indicators' — 1. expanding or contracting blocks, 2. appearance of gaps, 3. pierced trend lines — must be in agreement to confirm major trend changes."

Once a cost trend begins it does not reverse itself suddenly. Its peculiar momentum causes the trend to proceed in the same direction for many months — even years.

PREDICTING NEW COST TRENDS is the purpose of Mr. Petit's Momentum Net Change Curve chartered at the left. This curve measures the change in the rate of change in costs by using the difference between the 12-months moving average of the Construction Cost Index for the current month and for the third month previous. Blocks are formed by the maximum and minimum difference during each quarter.

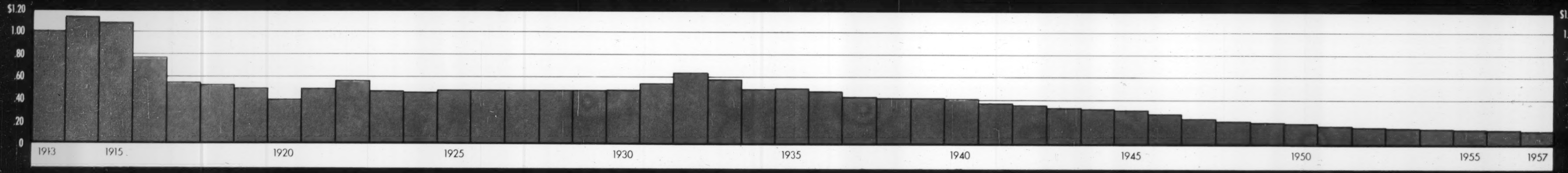
These blocks magnify the speed-up or slow-down in the momentum of each stage in the cost rise (or fall). They spot the turning point at its very beginning. While the net change curve remains on the plus side of the zero base line, costs are moving up. When the blocks cross this base line, a decline in costs has started.

ENGINEERING NEWS-RECORD
1957
Construction

ENGINEERING NEWS-RECORD

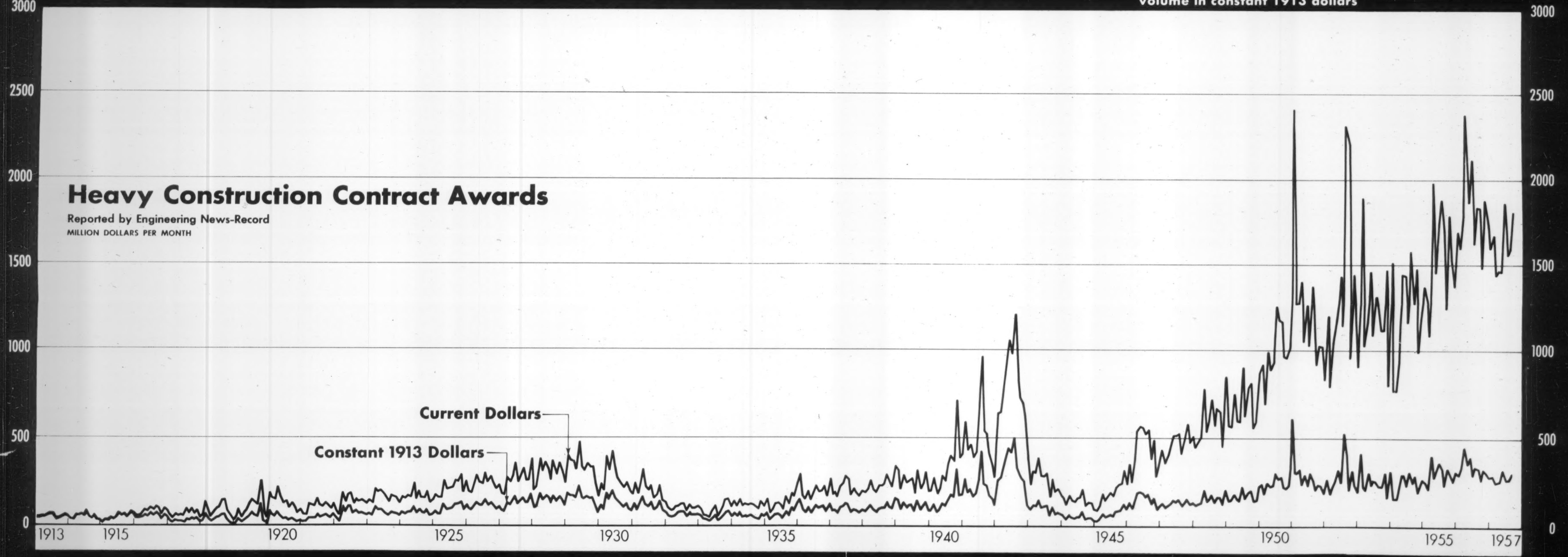
20TH ANNUAL REPORT ON CONSTRUCTION COSTS

How the cost rise Reduces the Purchasing Power of the Construction Dollar



. . . and this reduced purchasing power holds down the physical* volume of heavy construction put under contract

volume in constant 1913 dollars



ENR HEAVY CONSTRUCTION CONTRACTS

Value in
CURRENT DOLLARS vs "PHYSICAL" VOLUME

Year	Dollar Value in millions		Index, 1913 = 100	
	Current Dollars	Constant 1913 Dollars	Current Dollars	Constant 1913 Dollars
1913	$ 601	$ 601	$ 100	$ 100
1914	583	658	97	109
1915	585	625	97	104
1916	933	718	155	119
1917	739	407	123	68
1918	993	515	165	86
1919	1,716	596	286	99
1920	1,523	614	253	102
1921	1,194	600	199	100
1922	1,557	898	259	149
1923	1,904	890	317	148
1924	1,999	927	333	154
1925	2,559	1,240	426	206
1926	2,854	1,367	475	227
1927	3,254	1,581	541	263
1928	3,579	1,731	596	288
1929	3,950	1,909	657	318
1930	3,173	1,559	528	259
1931	2,432	1,352	405	225
1932	1,219	813	203	135
1933	1,068	652	178	108
1934	1,361	725	226	121
1935	1,590	863	265	144
1936	2,387	1,244	397	207
1937	2,438	1,144	406	190
1938	2,792	1,286	465	214
1939	3,003	1,379	500	229
1940	3,987	1,818	663	302
1941	5,869	2,602	977	433
1942	8,006	3,914	1,332	651
1943	3,062	1,225	509	204
1944	1,730	667	288	111
1945	2,289	881	381	147
1946	5,176	1,798	861	299
1947	5,659	1,629	942	271
1948	7,219	1,868	1,201	311
1949	8,157	2,088	1,357	347
1950	13,342	3,270	2,220	544
1951	13,605	3,132	2,264	521
1952	15,289	3,463	2,544	576
1953	15,171	3,140	2,524	522
1954	14,412	2,913	2,398	485
1955	18,722	3,624	3,115	603
1956	21,712	4,036	3,613	672
1957 (Forecast)	19,350	3,342	3,203	556

Engineering News-Record CONSTRUCTION COST INDEX, 1913=100

Components of Construction Cost Index and weighting: 25 cwt structural steel shapes, base mill price; 6 bbl portland cement, 20-cities average, bulk; 1.088 Mfbm 2x4, S4S lumber, 20-cities average; 200 hr common labor, 20-cities average.

Years 1903-12:	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912
	93.90	87.40	90.55	95.10	100.55	97.20	90.92	96.33	93.43	90.70

Yr-Mo	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Average
1913	......	......	......	......	......	......	......	......	......	......	......	......	100.00
1914	89.22	89.22	88.97	87.97	88.62	87.87	88.12	90.11	90.36	88.51	87.26	86.51	88.56
1915	87.12	87.36	87.66	90.16	90.16	88.96	90.51	91.76	93.01	96.16	101.06	107.06	92.58
1916	112.66	116.66	125.16	129.51	131.06	128.71	127.96	128.76	131.76	135.11	138.16	149.41	129.58
1917	167.75	167.75	175.66	183.41	187.61	199.26	204.01	198.41	190.31	167.11	166.51	167.11	181.24
1918	184.51	184.51	184.51	186.01	186.01	186.31	188.65	193.85	193.85	193.85	193.55	194.75	189.20
1919	198.05	201.50	198.05	191.25	191.25	191.85	193.65	196.65	202.85	202.25	206.85	206.85	198.42
1920	206.55	225.10	240.85	265.20	268.90	273.80	265.65	252.00	255.20	255.20	255.32	251.62	251.28
1921	230.87	230.67	224.27	213.07	210.82	209.82	203.82	193.47	188.27	182.57	166.32	167.82	201.82
1922	168.72	168.72	162.04	164.72	164.62	166.62	169.70	173.40	185.00	188.60	188.60	192.60	174.45
1923	191.70	197.40	205.25	213.50	216.70	220.70	222.10	221.50	221.50	220.30	220.90	217.90	214.12
1924	217.90	220.30	224.70	221.60	222.38	216.85	214.40	213.15	211.25	207.55	205.70	208.58	215.36
1925	210.40	209.70	210.20	209.55	207.20	204.60	204.60	204.60	202.10	205.35	205.95	205.95	206.68
1926	207.15	206.55	207.65	207.05	207.30	204.80	207.80	208.30	208.30	209.80	210.80	210.80	208.03
1927	211.50	210.15	208.80	209.00	206.80	205.55	203.68	205.50	203.60	204.40	201.98	203.90	206.24
1928	203.90	204.65	204.65	206.40	207.00	206.15	206.65	207.29	207.29	207.71	209.46	210.16	206.78
1929	209.40	210.40	207.78	203.40	205.15	205.65	204.77	205.91	207.57	206.32	208.46	209.46	207.02
1930	208.96	206.46	206.80	207.12	205.86	203.36	200.95	200.95	199.58	198.72	198.54	196.86	202.85
1931	194.48	196.61	194.51	191.63	189.33	187.23	174.37	171.38	171.40	169.78	169.28	166.23	181.35
1932	162.48	161.82	157.24	153.12	152.78	152.20	153.36	156.80	157.96	159.16	158.20	158.46	156.97
1933	158.44	159.30	158.44	160.16	164.39	163.41	165.50	167.00	175.48	187.74	190.14	192.14	170.18
1934	191.26	194.06	194.06	195.86	199.61	199.61	199.65	198.40	200.58	200.86	201.36	201.86	198.10
1935	198.22	195.07	194.41	194.65	193.96	196.73	197.43	197.45	197.30	197.50	197.35	197.20	196.44
1936	201.23	201.33	201.63	202.80	204.05	205.08	204.80	208.48	208.88	211.53	211.50	215.70	206.42
1937	221.20	222.05	224.75	231.35	233.45	237.25	239.90	240.65	241.62	241.90	241.40	241.05	234.71
1938	239.62	238.99	238.79	237.95	236.80	236.86	232.29	232.39	232.70	234.30	234.40	234.89	235.83
1939	234.72	234.31	234.43	234.86	234.69	235.02	234.94	234.90	234.97	236.86	238.20	238.17	235.51
1940	238.34	238.32	238.29	238.26	238.86	241.59	242.15	242.18	244.13	245.02	247.24	249.12	241.96
1941	249.69	250.50	250.71	252.40	255.55	256.79	258.18	260.41	263.12	264.46	266.13	266.16	257.84
1942	267.63	269.41	269.71	271.78	272.30	274.19	277.65	281.61	281.61	282.44	283.64	283.69	276.30
1943	283.45	283.48	285.24	288.80	289.87	289.94	289.92	291.38	294.09	294.31	294.41	294.51	289.95
1944	294.57	295.05	295.34	297.70	298.00	298.72	299.94	300.42	300.46	301.06	301.09	302.30	298.72
1945	302.50	303.70	304.50	306.43	307.43	308.99	308.99	309.08	309.28	309.28	309.28	313.48	307.75
1946	316.32	319.52	323.83	334.59	339.69	348.72	354.70	361.37	360.19	360.94	362.47	369.30	345.98
1947	386.97	393.73	395.45	399.56	399.98	406.63	413.75	422.85	426.38	434.58	436.91	441.13	413.24
1948	441.65	442.67	443.60	443.64	444.86	455.80	464.83	477.11	478.40	480.21	478.25	477.66	460.72
1949	477.41	475.37	474.80	474.34	472.10	473.78	477.46	478.28	479.78	480.54	480.02	480.32	477.02
1950	484.74	484.85	488.35	491.94	496.55	506.88	512.67	521.36	530.97	536.23	530.01	530.83	509.62
1951	532.53	538.60	539.83	540.57	543.53	543.37	542.94	543.46	543.57	547.11	547.65	548.27	542.65
1952	548.43	549.86	551.20	554.72	557.71	562.29	571.25	584.29	586.68	589.03	589.21	588.09	569.40
1953	587.87	587.79	588.04	590.07	589.57	593.71	604.64	612.55	610.89	611.64	611.80	611.30	599.99
1954	614.06	614.73	614.01	615.38	618.71	621.91	628.26	641.68	640.18	641.49	642.42	642.71	627.96
1955	643.72	645.24	645.70	647.49	653.26	655.96	660.09	672.24	672.74	673.89	673.20	673.13	659.72
1956	676.36	680.21	680.20	683.28	688.43	692.13	694.75	696.31	704.91	703.88	704.13	703.82	692.37
1957	707.90	710.06	708.64	709.30	715.70	721.36	724.15	738.63	737.78	...	...	...	...

Engineering News-Record BUILDING COST INDEX, 1913=100

Components of Building Cost Index and weighting: 25 cwt structural steel shapes, base mill price; 6 bbl portland cement, 20-cities average, bulk; 1.088 Mfbm 2x4, S4S lumber, 20-cities average; 68.38 hr skilled labor, 20-cities average.

The ENR Building Cost Index using a skilled labor component was established in 1938 when it became evident that common labor wages were rising faster percentage-wise than skilled workers' wages.

Originally common labor was selected as the Construction Cost Index labor component because it was considered to be the base for all construction wages. But government interpretation of "prevailing" wages, on aid to relieve the depression of the Thirties, pushed common wage averages up faster than skilled. This skilled labor component uses the ENR 20-Cities series which averages rates for bricklayers, carpenters and structural ironworkers including fringe benefits.

This was equated to the common labor component in 1913 in percentage of the index value, which gave a weighting of 68.38 hours of skilled labor to be priced for each index period. The materials component is the same in both Indexes.

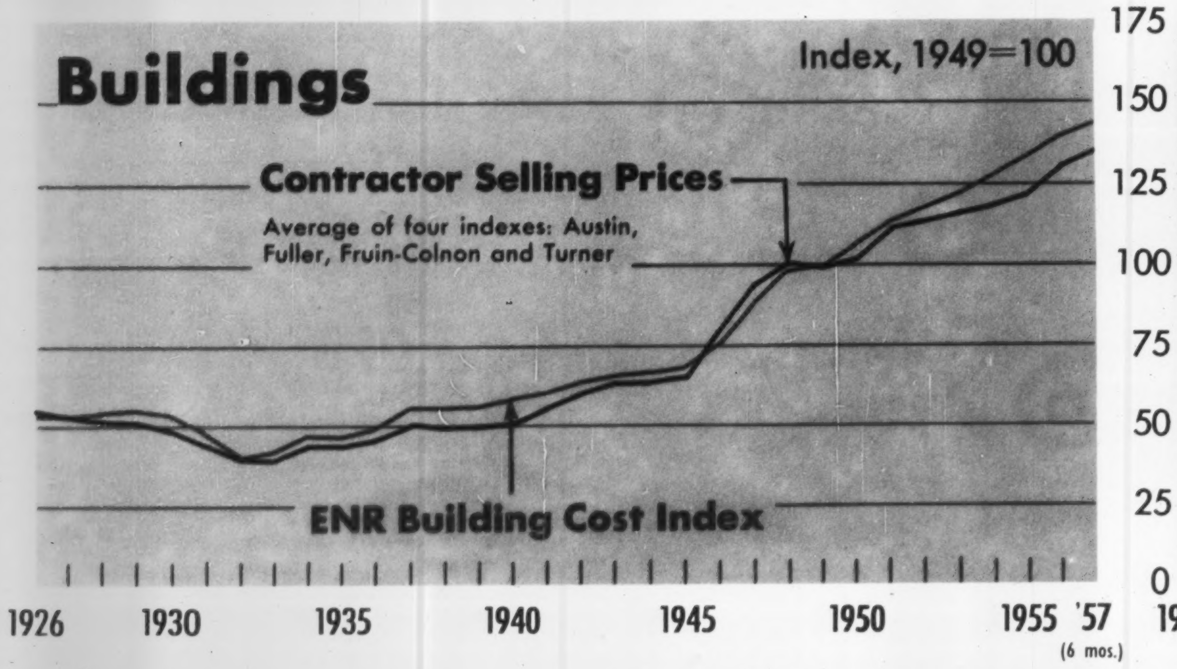
	Annual Average
1913	100.00
1914	91.91
1915	95.28
1916	130.88
1917	166.79
1918	159.10
1919	158.77
1920	207.23
1921	166.05

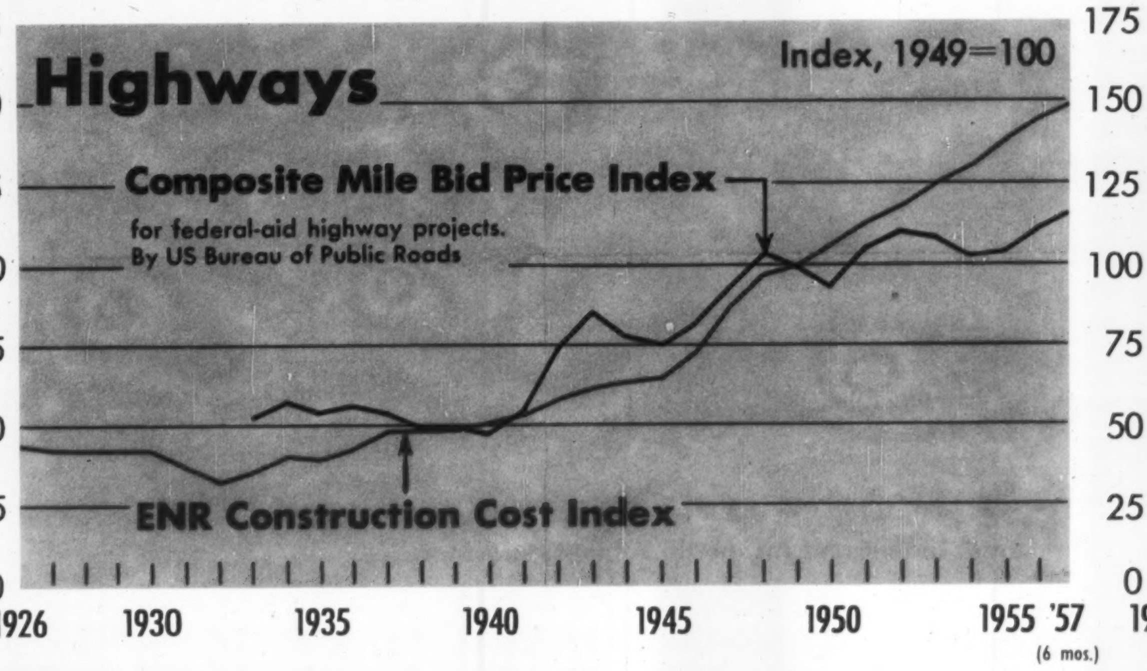
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
1922	147.12	146.47	145.19	147.12	149.02	149.77	150.85	154.55	164.15	167.75	167.08	169.10	154.85
1923	168.20	172.55	178.40	186.00	188.90	191.30	191.40	191.50	192.20	191.00	192.35	188.00	185.98
1924	189.30	191.70	194.10	191.80	192.48	187.65	184.50	183.25	181.35	178.35	176.50	178.38	185.78
1925	182.70	184.50	184.50	184.65	182.80	183.00	182.71	183.00	180.50	181.75	182.35	183.05	182.93
1926	183.94	183.65	184.25	184.05	183.55	181.80	184.30	185.10	185.10	187.95	187.95	187.95	184.96
1927	187.80	189.15	187.30	186.00	185.40	185.75	183.88	186.50	184.60	186.60	184.98	185.10	186.09
1928	185.90	187.15	187.15	188.80	190.10	187.55	187.55	187.55	187.55	187.55	188.80	190.00	187.97
1929	190.00	190.00	190.00	190.00	191.25	191.95	191.95	192.75	191.55	190.30	190.30	190.30	190.86
1930	190.30	188.50	189.20	188.80	187.90	185.40	183.25	183.65	182.40	181.80	181.80	181.80	185.40
1931	180.70	181.95	180.19	177.55	174.55	169.65	164.05	160.10	159.50	158.10	157.40	154.15	168.10
1932	150.60	147.20	145.88	135.68	136.38	137.58	139.48	139.40	139.60	140.00	139.50	140.00	140.94
1933	140.82	141.70	140.80	141.50	143.85	143.20	144.30	145.90	154.50	157.05	159.00	160.70	147.78
1934	160.15	161.30	161.70	163.15	168.15	168.15	169.15	168.40	170.10	170.20	170.20	170.20	166.74
1935	166.50	165.75	164.10	164.40	163.30	164.85	165.25	166.20	166.05	167.30	167.30	167.15	165.76
1936	168.25	168.43	169.68	170.00	170.35	170.18	170.85	173.93	174.33	175.33	175.50	179.30	172.18
1937	185.45	186.55	187.65	194.95	197.15	199.20	199.80	200.65	200.62	201.00	200.30	200.45	196.15
1938	198.62	198.99	199.29	198.21	197.86	198.22	194.39	194.49	194.80	195.48	195.58	196.07	196.83
1939	196.24	196.23	196.46	196.45	196.60	196.41	196.78	196.54	196.61	198.50	201.24	201.21	197.44
1940	201.52	201.50	201.47	201.44	201.17	201.65	201.68	201.71	203.13	204.02	206.24	208.19	202.81
1941	207.94	208.42	207.88	208.60	209.24	209.41	210.22	212.45	214.58	215.92	216.54	216.37	211.46
1942	217.12	218.44	218.88	219.55	220.14	221.18	223.45	225.39	225.46	225.90	226.58	226.63	222.39
1943	226.87	226.90	226.66	227.50	227.64	227.71	227.89	228.49	231.20	231.29	231.39	231.49	228.75
1944	231.55	232.03	232.32	234.50	234.80	235.33	235.55	236.09	236.00	236.00	236.10	236.51	234.73
1945	236.51	237.71	237.85	238.46	238.46	239.37	239.64	239.94	240.07	240.35	240.55	240.82	239.14
1946	242.23	243.94	245.41	254.37	258.06	265.28	267.25	272.29	272.37	273.01	273.99	279.97	262.25
1947	294.62	301.56	303.28	305.21	304.64	307.42	308.90	317.75	322.58	327.29	329.22	333.06	312.96
1948	333.58	335.49	334.22	334.56	333.93	339.26	342.42	355.45	356.70	357.07	355.86	355.55	344.51
1949	354.98	352.94	352.54	351.42	348.92	349.28	349.46	350.85	351.98	353.02	352.91	353.21	351.79
1950	356.23	356.48	359.98	362.78	364.27	373.39	377.66	383.12	392.18	397.42	390.21	391.44	375.47
1951	392.99	398.21	399.32	400.06	401.10	400.84	400.34	400.15	400.26	403.43	404.50	405.79	400.56
1952	405.76	406.19	407.42	407.94	410.30	412.50	414.46	422.36	424.40	424.77	426.04	424.92	415.58
1953	425.04	425.24	424.89	426.39	426.23	426.21	435.15	436.86	435.98	435.98	435.95	435.45	430.78
1954	436.42	437.09	436.71	437.48	438.24	439.67	444.05	455.54	454.28	455.54	456.34	456.77	445.68
1955	457.91	459.43	459.63	460.62	462.55	464.82	467.52	478.03	479.15	479.99	479.30	478.70	468.80
1956	480.48	483.08	483.14	485.56	487.36	488.70	489.23	491.22	500.10	499.54	500.48	500.17	490.76
1957	501.96	502.59	501.37	501.37	503.01	504.17	506.62	516.90	516.12	. . . .	. . .	. . .	. . .

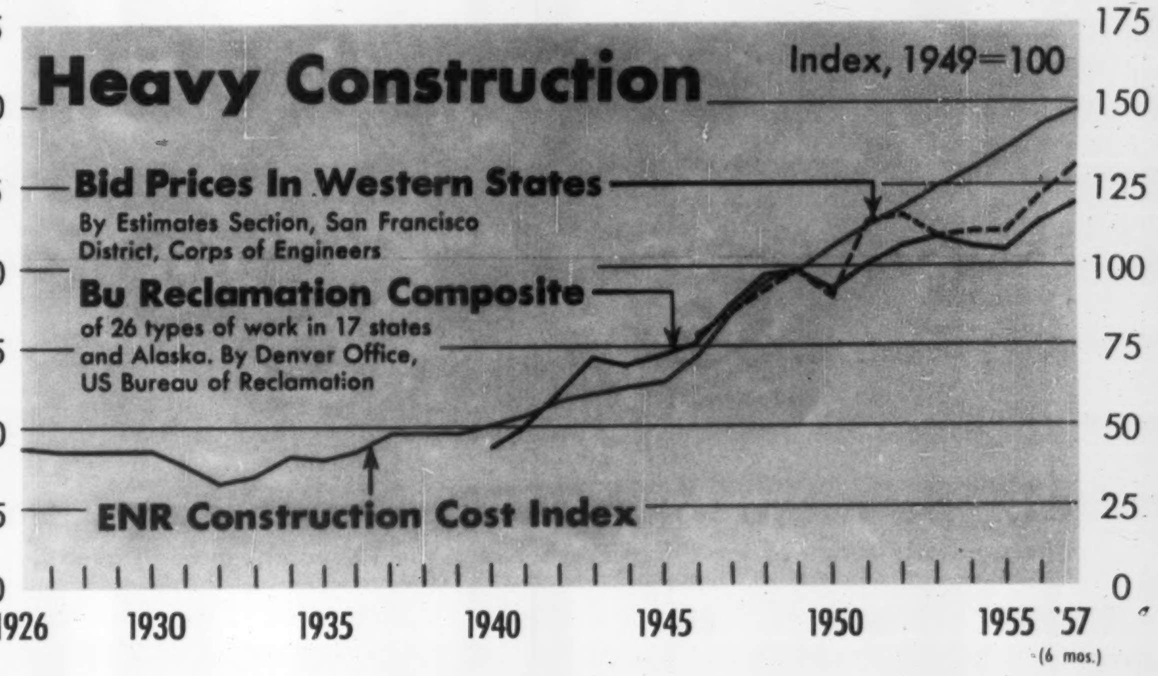
CONTRACTOR PRICES COMPARED WITH CONSTRUCTION COSTS

CONTRACTOR PRICES COMPARED WITH CONSTRUCTION COSTS

Competition, Good Management and Mechanization Have Held Contractors' Prices to a Slower Rise than the Increase in Materials and Labor Costs

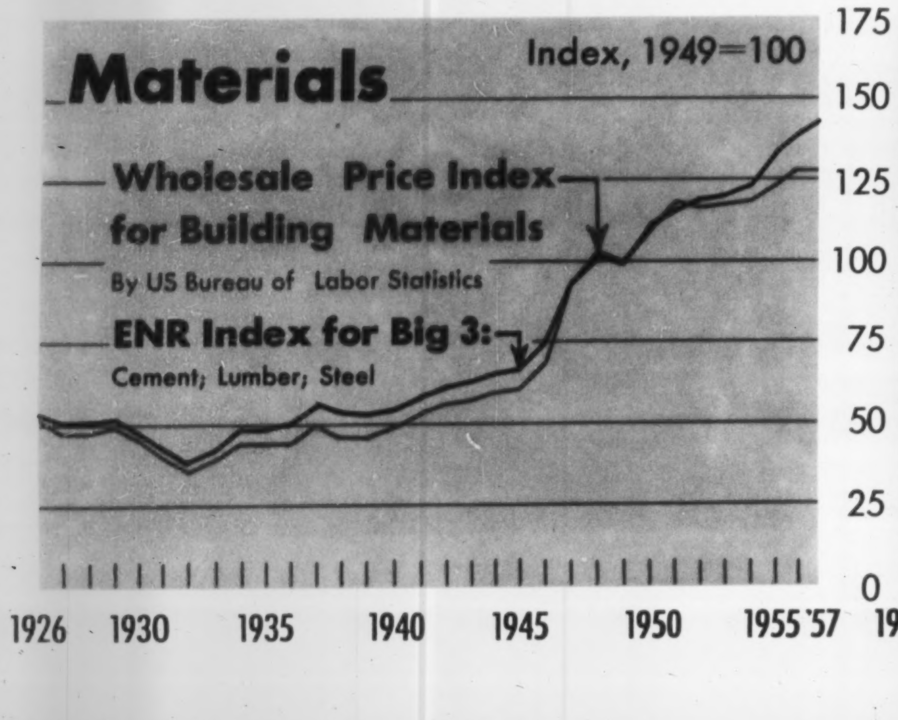


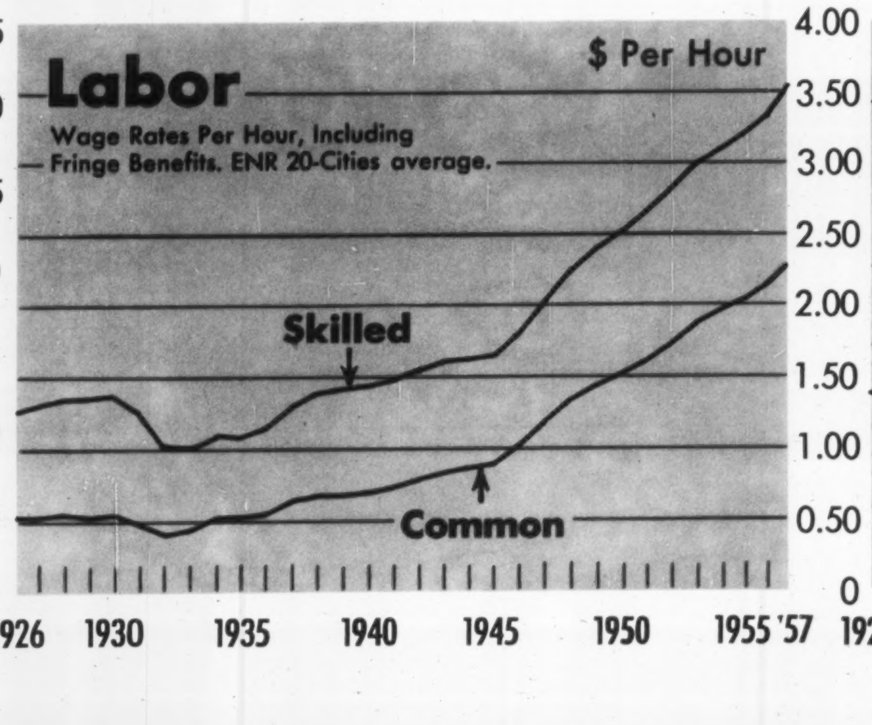


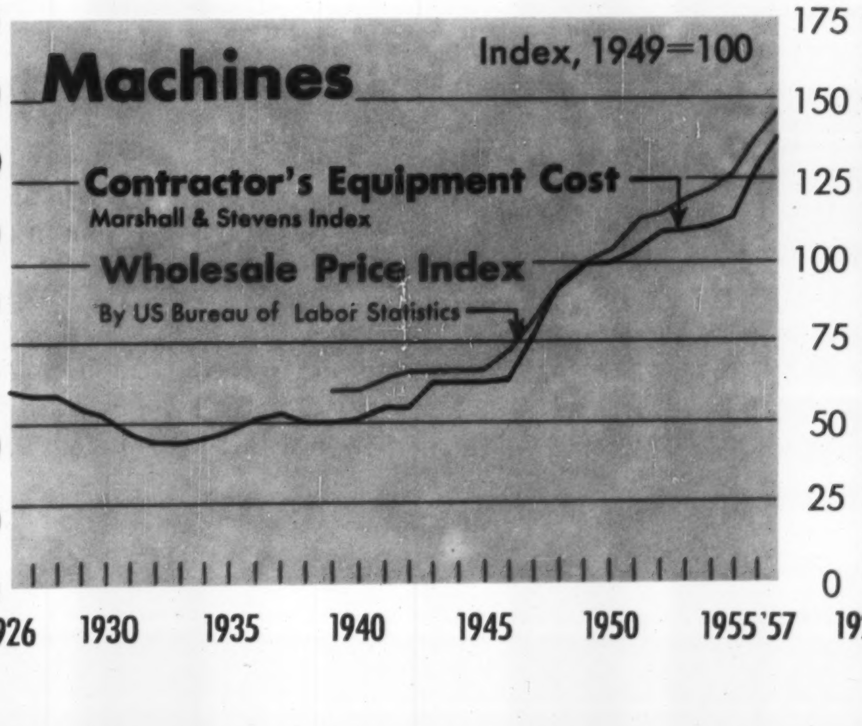


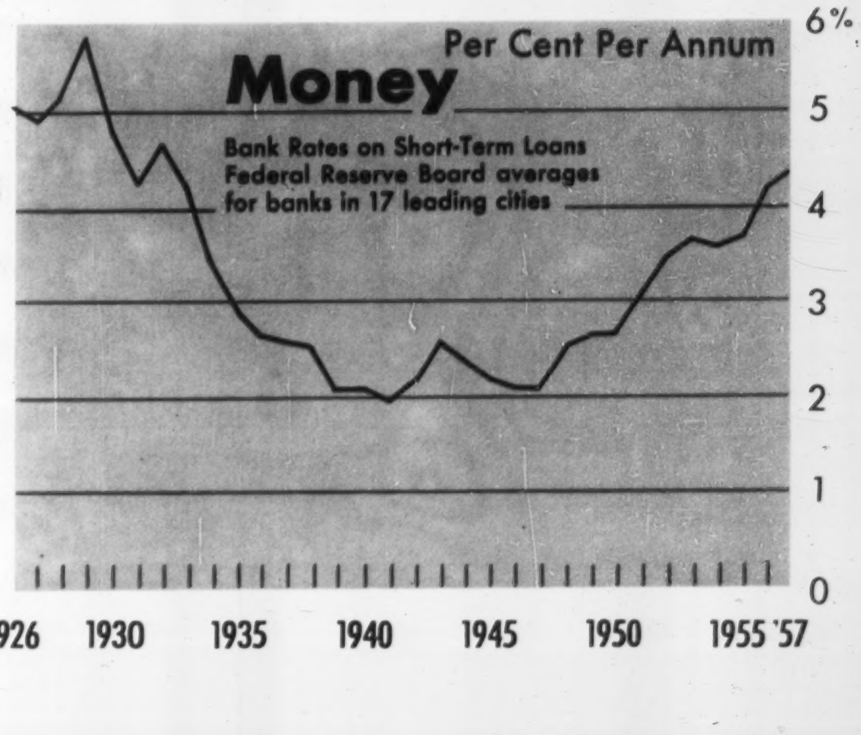
TRENDS IN PRICES OF WHAT CONTRACTORS HAVE TO BUY

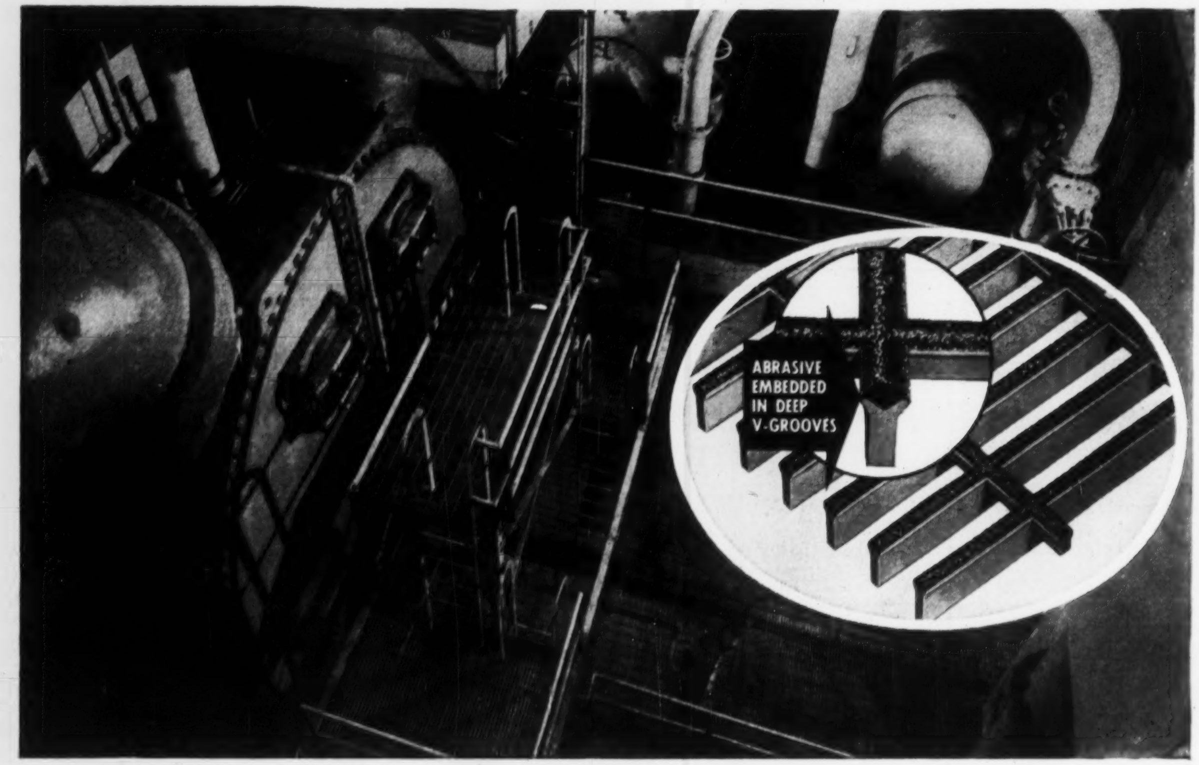
Prices of Construction Materials, Labor and Machinery Set New Highs and the Cost of Working Capital is Up, too











Wears longer than steel . . . non-skid under oily conditions . . .

Reliance Relgrit®

abrasive embedded grating

Reliance Relgrit abrasive embedded grating and treads provide the only truly non-skid surface. Even when covered with oil, Relgrit has a coefficient of friction 30% greater than dry steel grating. Wear tests have shown that the abrasive surface will wear longer than steel, and retain its non-skid quality during its entire service life.

The top surfaces of the bearing and cross bars have ⅛" deep V-grooves in which is embedded abrasive aluminum oxide grains in a hard resin. The material is not affected by water, oil, gasoline, greases, or commonly used acids, alkalis and other chemicals. Together with its wear resistance, this gives Relgrit a long service life.

If you have floors or stairs which become oily, greasy, wet, or slick from any cause, Relgrit can provide safe footing at very low cost. Write on your letterhead for free sample and literature, or ask for our representative to call. It will pay you to investigate this remarkable new grating.

*you can't slip on Relgrit**

*Patent applied for

Please send Bulletin R655B describing Relgrit abrasive embedded grating and treads.

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COMPANY

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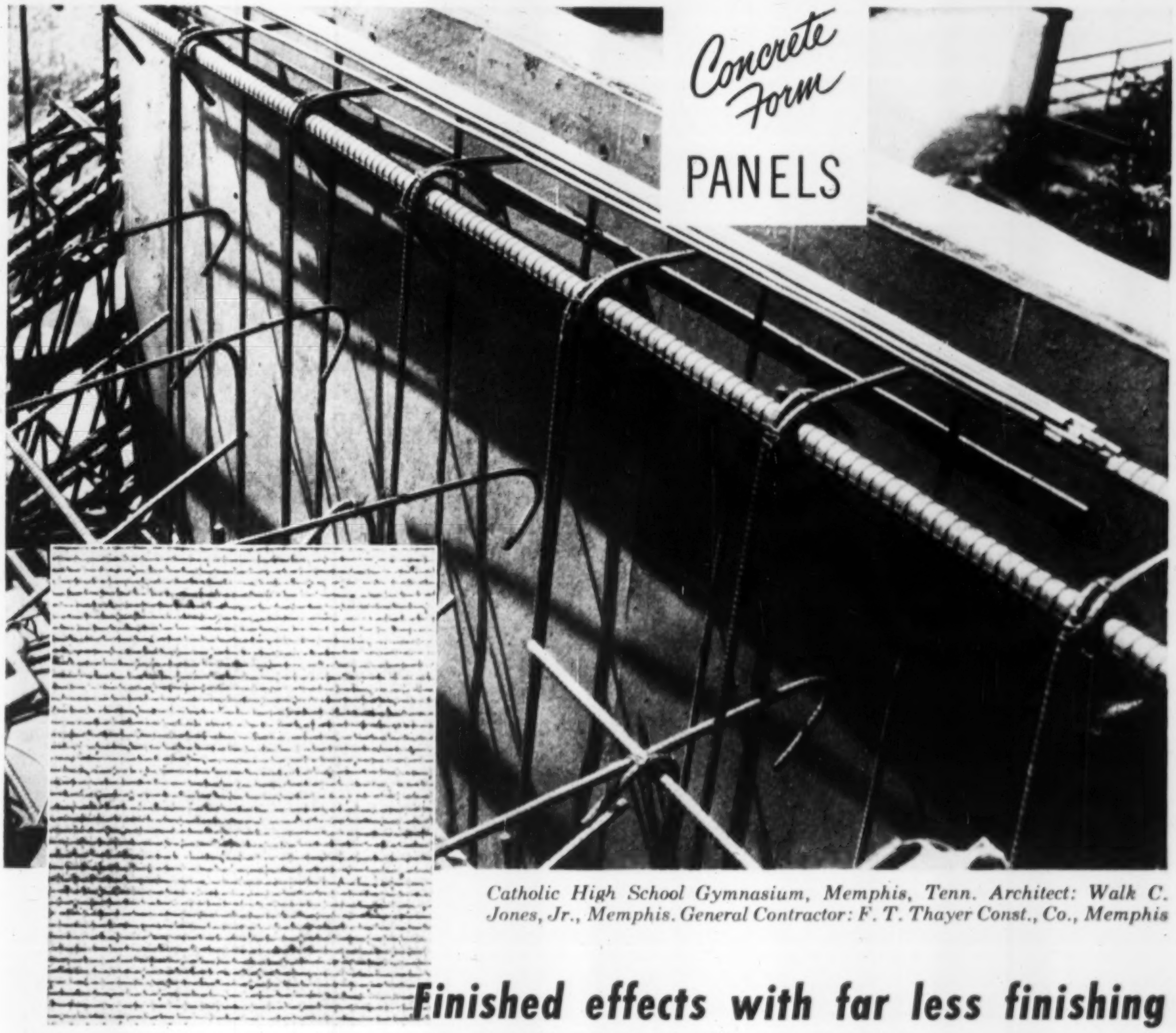
P.O. Box 510-A, McKeesport (Pittsburgh District), Pa.

Relgrit Abrasive Gratings and Treads • Lightweight Bridge Flooring
Steel, Stainless and Aluminum Grating • Steel Mill Equipment

MASONITE

Concrete Form PANELS



Catholic High School Gymnasium, Memphis, Tenn. Architect: Walk C. Jones, Jr., Memphis. General Contractor: F. T. Thayer Const., Co., Memphis

Finished effects with far less finishing

Screen side to concrete (as shown above)

- Cuts hand rubbing costs 50% or more.
- Where painting is required, provides a superior paint bonding surface.

Smooth side to concrete. For smooth, blemish-free, painted or unpainted surfaces. Hand rubbing virtually eliminated.

Spend less for hand rubbing—up to 50% less.

Pour against the screen side of Masonite Concrete Form Presdwood®. You'll find the tiny projections left in the concrete actually speed up the rubbing process, give you a better finish—faster!

These dense, grainless panels are easy to work, using ordinary carpenter tools...easy to handle...leave no blemishes...won't split, splinter or crack. And you can use them again and again. Send the coupon for a free sample.

®Masonite Corporation—manufacturer of quality panel products

MASONITE® PRODUCTS

MASONITE CORPORATION
Dept. ENR-10-17, Box 777, Chicago 90, Ill.

Please send me a sample of Concrete Form Presdwood and your booklet on cutting costs.

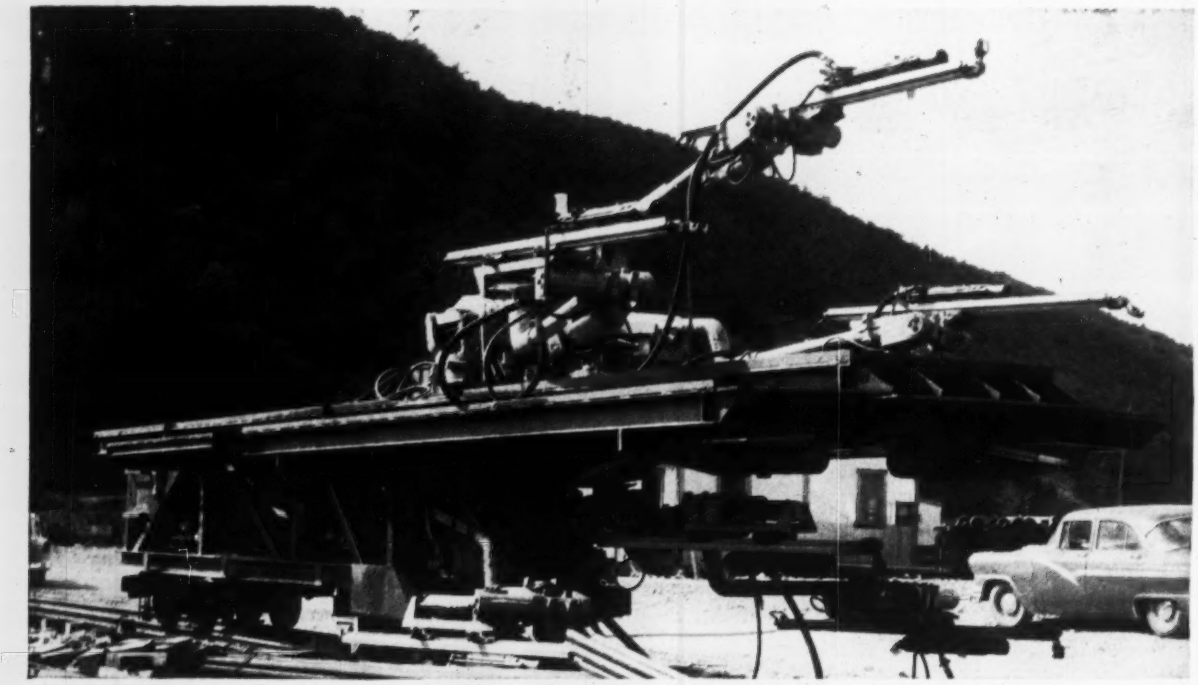
Name..

Firm.................................*Title*...........

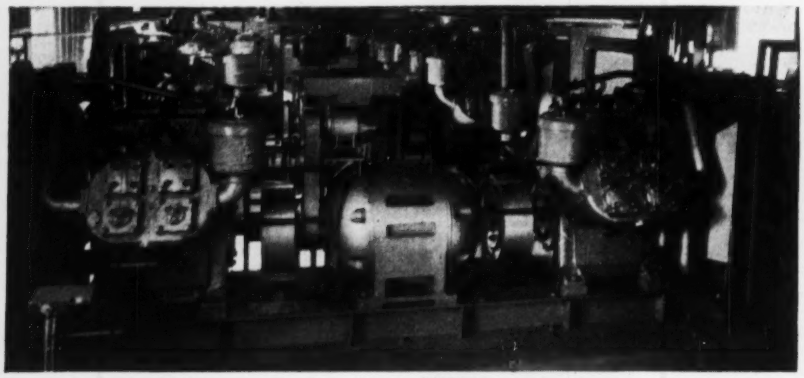
Address...

City.................................*State*..........

Zone .... *County*.................................



By April of this year, the contractors were using 30 Gardner-Denver hydraulic booms and drill positioners . . . 40 Gardner-Denver tunnel drills. Here's one of the six-boom, rail-mounted jumbos used to cut a 53-hole pattern for each round.



Thirty-one Gardner-Denver WBJ two-stage, water-cooled compressors—mounted in pairs with one motor for each pair—supply compressed air power. These four dual units are at one of the shaft headings.

Roof bolting goes faster, easier, with 24 Gardner-Denver roof bolting stopers on hand to drill the holes and tighten the bolts.

GARDNER-DENVER

More air power for the drilling operation comes from five Gardner-Denver rotary portables. These three are at the inlet adit.

EQUIPMENT REPORT

on the 44-Mile

WEST DELAWARE TUNNEL

Job: West Delaware Tunnel of the New York City Board of Water Supply—being driven from Cannonsville to Lowes Corners.

Rough Bore: 14′. Workings: seven shafts—inlet and outlet adits.

Contractors: Drake-Grafe-Winston-Tecon-Conduit—Contracts #451-452.
West Delaware Tunnel Constructors—Contracts #454-455.

GARDNER-DENVER EQUIPMENT ON THE JOB:

40 CF93N 3½″ bore drifter drills mounted on aluminum guide shell for 6′ steel change.

30 JA or JB Hydraulic booms with power swing and equipped with:

30 DPU Universal hydraulic drill positioner.

5 JA Hydraulic fan line booms.

10 JMA Hydraulic power pumps.

2 DH123 4½″ bore drifters on SF aluminum feed for 6′ steel change.

3 DH143 5½″ bore drifters on RM chain feed for 6′ steel change.

2 DH143 5½″ bore drifters on RM chain feed for 12′ steel change (shaft work).

24 RB94SSP Roof bolt stopers with stop rotation and 36″ telescopic leg.

14 FL58N Feed leg drills with 4′ leg.

30 S58N Sinker drills.

12 VP4 Pneumatic sump pumps.

4 B37 35-lb. class breakers.

10 B87B 80-lb. class breakers.

2 HB Air hoists—1250-lb. lift.

12 HK Air hoists—2000-lb. lift.

3 T-23 Backfill tampers.

2 MEA Air motors for grout mixer.

4 FC-FS Size 10″ x 3″ x 10″ grout pumps.

1 81 Gardner-Denver Keller air grinder.

31 WBJ Stationary air compressors.

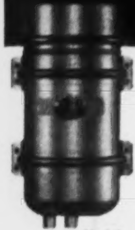
5 RP600D Rotary portable air compressors.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

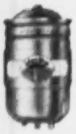
GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

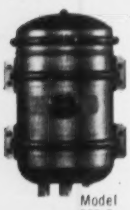
THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE FOR EVERY TYPE OF OIL!


Model 750-C

Model 200-S


Model 135-S

Model 78


Model 500-C

Models F-155 F-120

Models 272-C 363-C

Models 750-2C 750-3C

ONLY A GENUINE

Luber-finer

PLUS A GENUINE LUBER-FINER PACK

CAN GIVE THE EXCLUSIVE PATENTED FILTERING PROCESS THAT HAS MADE LUBER-FINER THE Standard Of The Industry Since 1936

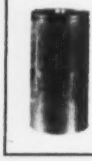
MODELS 78, 135-S, 200-S, featuring single-bolt lid, screw-in type pack, and overall compact design for use where space is limited. These Models provide the ultimate in filtration for passenger cars, small trucks and tractors, and other similar engines up to 5-quart, 6-quart, and 7-quart crankcase capacities.

MODELS 272-C and 363-C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, screw-in type pack, and rugged construction throughout. Designed for heavy-duty service on gas, gasoline or diesel engines up to 3-gallon and 4-gallon crankcase capacities.

MODELS 500-C and 750-C, featuring the Luber-finer single-bolt lid clamp O-Ring lid gasket, large-capacity packs, and extra rugged construction to withstand the most severe service. Designed for use on gas, gasoline or diesel engines up to 5-gallon and 8-gallon crankcase capacities. Also widely used on fuel lines, hydraulic oil systems, and many other industrial applications.

MODELS 750-2C & 750-3C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, and multiple packs for extra large capacity. Available with either wall or floor mounts for industrial use on engines up to 35-gallon sump, fuel lines up to 15 GPM, hydraulic oil systems up to 450 gals. For larger capacities, two or more Units can be connected in parallel.

MODELS F-120 and F-155, for gasoline and diesel fuel lines on mobile, stationary, or marine applications. Extremely efficient in removing impurities and contaminants from fuel. Single Units will handle flow rates from 0.5 to 1.0 GPM on suction or gravity flow. For larger capacities, connect two or more Units in parallel, or install on pressure-side of fuel pump.



GENUINE LUBER-FINER PACKS available in two types...

DIESELPAK — Expressly designed and recommended for use with all detergent-type compounded oils. Has the ability to remove the most finely dispersed contaminants without removing or affecting the additives.

REFINING PACK — For use on straight mineral oil, synthetic oils, diesel fuel oil, hydraulic fluids, etc.

★ THERE IS A GENUINE LUBER-FINER MODEL FOR PASSENGER CARS, TRUCKS, TRACTORS, STATIONARY AND MARINE ENGINES, HYDRAULIC OIL SYSTEMS AND MANY INDUSTRIAL APPLICATIONS.

WRITE FOR COMPLETE INFORMATION TO DEPT. 61

LUBER-FINER, INC. 2514 S. Grand Ave., Los Angeles 7, Calif

(Continued from page 40)

that shipment of levels is more expensive than of electronic load cells. This is very true but levers themselves on heavy scales represent only a small part of the total weight with the big part being concentrated in the heavy steel weighbridges used to support the load receiving platforms.

The article further states that load cell weighing may sometime allow a shallower pit depth which yields a saving in concrete and excavation. This is true, but the fact was not mentioned that the best investment a scale user can make toward long life and accuracy of his scale, especially on an outdoor installation, is a pit of sufficient depth to allow all moisture and dirt to drain away from the elements and permit a large amount of air circulation and provide easy entrance of maintenance people into the pit for cleaning, adjusting, etc. There is no saving that can be effected in excavation and concrete on a properly installed pit for the electronic or mechanical scale. Finally, many states have laws requiring scale pits to have a minimum depth that far exceeds actual scale requirements.

The article went to some length to describe the flexibility of the electronic system in that it could be easily moved from one installation to another even in the highest capacities and pointed out this could be accomplished in a private automobile. The load cell equipment used in electronic scales is only a small part of the complete installation. Heavy steel weighbridges obviously cannot be moved in the private automobile.

The above is merely to clear up a few points, not to deprecate electronic weighing. It is our opinion that electronic weighing does have a bright future because electronic weighing provides means of control that will automate many industrial processes that now require labor.

In comparison, mechanical scales do not offer the wide means of control provided by electronics. In certain instances advantage can be taken of electronic load cells to make installations in crowded places where room for mechanical levers is not available. To date, however, you cannot expect equivalent accuracy from electronic scales that you can from mechanical scales.

In considering a job, our company always endeavors to make the application that will provide the best results. To do this we may use a full mechanical scale for accuracy and low maintenance cost. We may use a full

(Continued on page 50)

This Skylight is a Filter!

Korhumel Steel &
Aluminum Co.,
Evanston, Ill.
Architects:
Fox & Fox, Chicago

screens out eye-fatiguing glare and body-tiring heat

Frosted *AKLO** Glass softens and diffuses transmitted daylight, reduces glare of direct sun, bright sky and dazzling reflections. Its subdued blue-green color is restful to the eyes.

AKLO Glass also reduces solar heat. *AKLO* in ¼″ thickness, shuts out as much as 44% of the sun's radiant heat energy.

AKLO is made by Blue Ridge Glass Corporation where "creative ideas in glass" are born. Among them, patterned, textured, tempered and wired glass for industrial glazing; spandrel glass for curtain walls. Phone your L·O·F Distributor or Dealer (listed under "Glass" in the yellow pages). He will be glad to help you select the kind of glass that best suits your needs. Or write to Libbey·Owens·Ford Glass Company, 608 Madison Avenue, Toledo 3, Ohio.

AKLO GLASS **FILTERS DAYLIGHT**

*Reg. T.M.—licensed by Corning Glass Works

made by BLUE RIDGE GLASS CORP., *Kingsport, Tenn.* *sold by* LIBBEY·OWENS·FORD *Glass Distributors*

JAEGER "600" ROTARY easily powers dual 4" drill rig in 18' limestone ledge at Nelson Brothers quarry, Lathrop, Kansas. Compressor maintains plenty of reserve power behind the drills at characteristic slow, economical operating speeds.

How Jaeger air cuts drilling cost

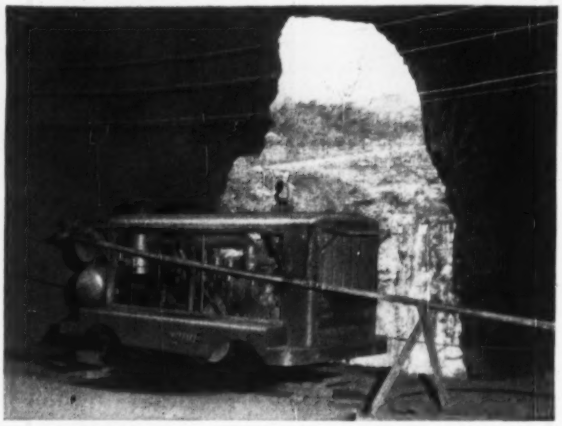
Same mobile "600" saves money in quarry and on 450,000-ton excavation for Turnpike

With its Model 6-71 GM diesel engine easing along at fuel-saving speeds that never reach 1650 rpm, this truck-mounted Jaeger "600" rotary compressor powers two 4" drills at top production efficiency in limestone quarry supplying concrete and road aggregates.

Over long hours of steady drilling, the slow-speed, efficient operation of the Jaeger "600" (1650 rpm full load speed instead of 1750-1800) means substantial savings in fuel and engine and compressor wear. These savings were repeated when Nelson Brothers, the owners, shifted their mobile rig to a 450,000-ton rock excavation project for the Kansas Turnpike.

Slow-running, efficient performance, resulting in fuel economy, fewer fpm of engine piston travel and thousands fewer compressor revolutions per hour, is characteristic of all Jaeger rotaries. Smaller units (125, 250 and 365 cfm) deliver full volume at 1700 rpm versus 1800 to 1950 rpm in similar compressors having no more than equal, and often less, air capacity.

It will pay you to make your next compressor a Jaeger. Call or visit your Jaeger distributor for full details and prices, or write us for Catalog JCR-5.

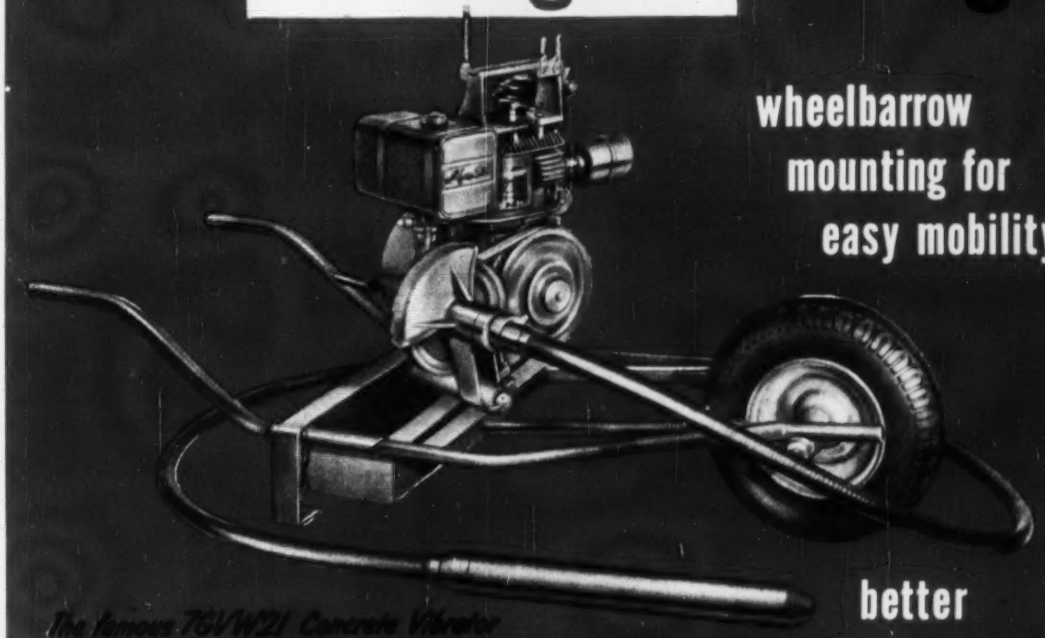


LOGS 400' (IN 12'-18' DEPTHS) PER 8-HOUR SHIFT, IN HARD MISSOURI LIMESTONE: Using only 36 gallons of fuel per 8 hours, Jaeger "600" powers two 4" drifters to this average daily production in Federal Materials Company underground quarry, Cape Girardeau, Mo. Jaeger slow-speed, high efficiency performance saves fuel and wear on every job.

THE JAEGER MACHINE COMPANY
200 Dublin Avenue, Columbus 16, Ohio
PUMPS • CONCRETE MIXERS • SPREADERS • FINISHERS • TRUCK MIXERS

now, in concrete vibrators, too,

if it's Remington, it's right !



wheelbarrow mounting for easy mobility!

better concrete at lower cost!

The famous 7GVW21 Concrete Vibrator has 4 great features that make it right for you!

- **Dependably powered by rugged single-cylinder, 4-cycle air-cooled gasoline engine with countershaft drive and automatic clutch.**

This versatile unit can also be used to power attachments for concrete surfacing, sanding, wire brushing, pumping and other jobs.

- **Long-reaching flexible shaft made up of 7 ft. or 14 ft. sections. Extra sections can be added as needed.**
- **Unit can be moved right along with the work on pneumatic-tired wheelbarrow mounting. This unit is also available on 360° swivel round base mounting.**

MODEL 7GVW21 *5 HP concrete vibrator. Available with 2⅜" x 20" 7,000 RPM vibrating head or 2⅛" x 12" 10,000 RPM vibrating head.*

You'll use less cement, coarser aggregate and produce denser, more uniform concrete . . . and do it in fewer man-hours!

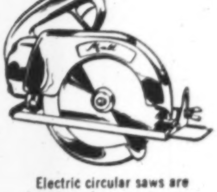
That's a mighty big order to be sure! But it's being done every day on every kind of concrete job by these indispensable vibrators by Remington—the newest name in power tools and famous for 141 years for quality in sporting firearms and ammunition.

You name it . . . Mall Tool Company, Division of Remington Arms Company, Inc., gives you a vibrator for every application from small form work to large mass concrete compaction. Over a dozen models, most available in gasoline engine, electric or pneumatic, including the new 1-man 115-volt vibrator with motor-in-head. Let us send you our latest catalog today!

Remington

MALL TOOL COMPANY
Division of Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Mall®



Electric circular saws are best buys for every purpose

Electric impact wrenches speed up work on heavy equipment

Specifications subject to change without notice.

MALL TOOL COMPANY
Division of Remington Arms Company, Inc., Dept. ENR-10
Bridgeport 2, Connecticut

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Picture of a Time-Saver . . .

Bates and Rogers Construction Corp. developed several unusual uses for their model HH "PAYLOADER" tractor-shovel that saved valuable time in finishing two bridge jobs on the Erie Section of the New York Thruway.

By attaching a special 10 foot boom to the bucket arms and utilizing the unit's precise hydraulic control for handling and positioning, they installed 70 sections of 18-foot prefabricated railing in a 7 hour period. The contractor also used the rubber-tired mobility of his "PAYLOADER" to good advantage in transferring the railings from truck to storage area to bridge. He saved time by getting on the new concrete sooner because the big pneumatic tires protected the new pavement against damage and the 22° axle oscillation permitted "PAYLOADER" travel safely over slab edges, curbs and other uneven ground.

It will pay you to have a Distributor demonstrate *time-saving* "PAYLOADER" flexibility and performance *on your work.* The Frank G. Hough Co., 772 Sunnyside Ave., Libertyville, Ill.

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MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY
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Send full
PAYLOADER®
data on

☐ Four-wheel-drive types —up to 9,000 lb. carry cap.
☐ Rear-wheel-drive types —up to 3,000 lb. carry cap.
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Name
Title
Company
Street
City
State
130 ENR

. . . Reader Comment

(*Continued from page 46*)

electronic scale to provide extensive controls where extreme accuracy is not necessary and advantages obtained overcome higher maintenance costs, or we may combine parts of mechanical units with electronic units to give better accuracy with extensive control and reduced maintenance.

C. G. GEHRINGER, MANAGER
Scale Division
Fairbanks, Morse & Company
Chicago, Illinois

. . . the rebuttal

Sir—Since much of Mr. Gehringer's comment deals with scale tolerances it might be well to offer the reader a clue to the significance of these various percentages. Generally, in the motor truck and railroad field tolerances are as follows: For new scales the error cannot exceed 1 lb for every 1,000 lb placed on the scale. On subsequent calibrations, it must read to within 2 lb per 1,000 lb of load.

In Minnesota, the regulations are more severe than those recommended by the National Bureau of Standards, and a new scale must be accurate to within ½ lb per 1,000 lb of applied load, or 1/20th of 1% as stated in my article. Minnesota did, in fact, two years seal two electronic scales to this accuracy. The word "sealed" when applied to a scale means that it has passed all regulations including the tolerance requirement and is approved for its intended use by weights and measures officials.

I grant that many lever systems are operating at accuracies better than 1/20th of 1%, as are many electronic scales. However, it still is not general practice to guarantee operation at tolerances beyond the standards listed above.

If the implication in Mr. Gehringer's statement, that load cells are guaranteed to 1/10th of 1% accuracy at total capacity, were true, an 8 cell 50 ton electronic scale could be in error as much as 800 lb with a 10,000 lb load. This is an 8% error and no electronic scale would be in use today if this was the best they could do. Actually, no state in the U. S. bases tolerance requirements upon a percentage of capacity load. Tolerances are based upon a percentage of the applied load.

Mr. Gehringer chose to compare the electronic scale load cell to a spring scale. It may be a happy analogy for lever system salesmen, but the stress-strain relationships in a load cell structure are based upon a thorough knowledge of the elasticity characteristics of selected materials.

(*Continued on page 56*)

ORDER RECEIVED
JAN 1957
FABRICATION STARTED
JUNE 1957
ERECTION BEGUN
JULY 1957
DECK POURING
AUG 1957
SOMERS-FITLER & TO
MACHINERY & SUPP
MILL, MINE, RAILROAD & CONTRACT
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NEFFCO COFFEE
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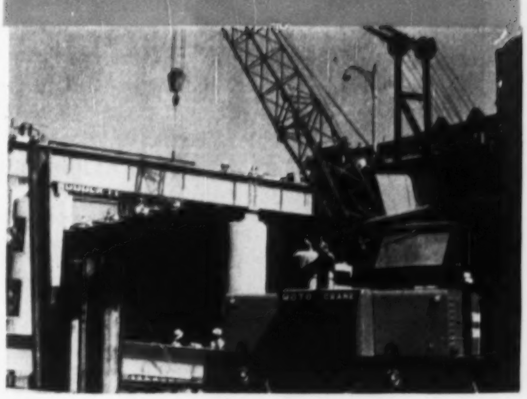

Part of a 5,000 ton project awarded to
Fort Pitt Bridge for

PITTSBURGH'S PENN-LINCOLN PARKWAY
Downtown Section

To alleviate part of the traffic problem in Downtown Pittsburgh this section of the new Penn-Lincoln Parkway had to go up on a tight schedule to coordinate with other construction work in progress. Reflecting a background of 60 years of handling urgent jobs, Fort Pitt Bridge started erection in approximately 180 days after the order was received.

STEEL FABRICATION and ERECTION by

FORT PITT BRIDGE WORKS

General Offices: **PITTSBURGH, PA.** *Plants at* **CANONSBURG, PA.**
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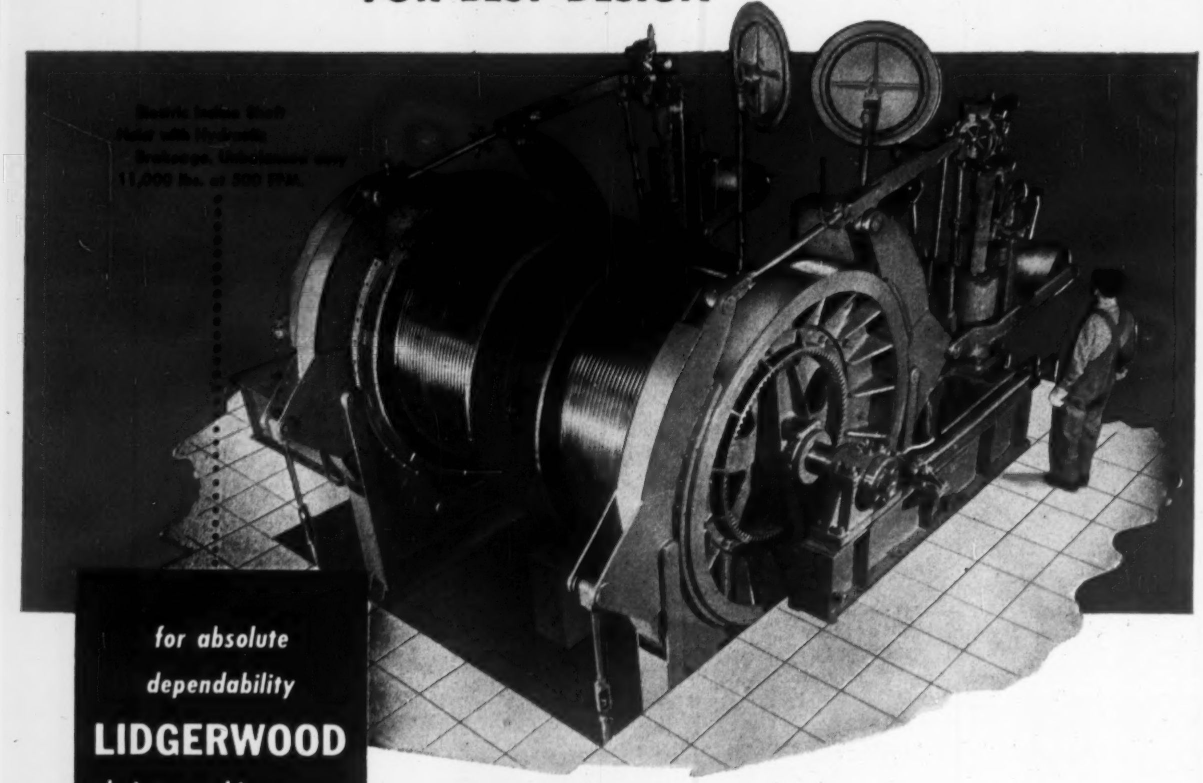
"There is no substitute for structural steel"

WHEN BUYING A *Hoist* REMEMBER...

BULK AND WEIGHT ARE NOT THE CRITERIA

FOR BEST DESIGN



Electric Incline Shaft Hoist with Hydraulic Brakeage. Unbalanced carry 11,000 lbs. at 500 FPM.

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LIDGERWOOD
hoists combine more
STRENGTH
UTILITY
SAFETY
with less bulk and weight

● For over twenty years welded steel drums have been a feature of LIDGERWOOD design. Because of the consequent saving in bulk and weight, as compared with cast construction, the balance of the hoist can be made more compact and considerably lighter, with no sacrifice of strength, safety or utility.

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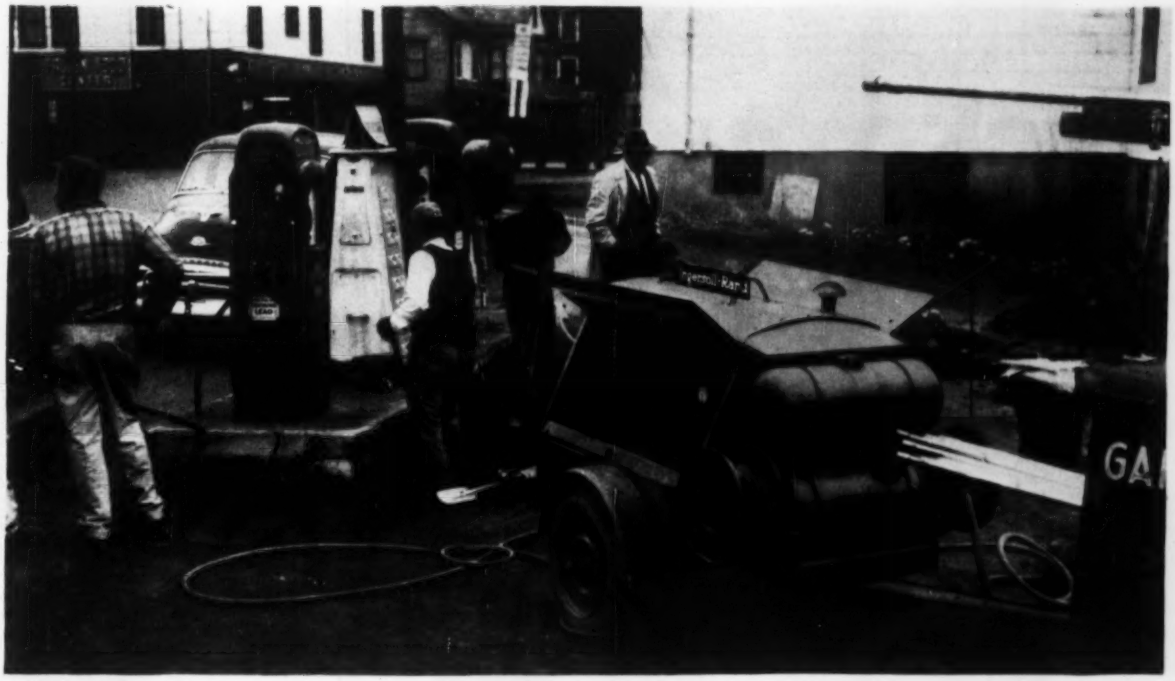

This job called for speed!

GYRO-FLO 85 saves time as contractor changes underground tanks at 40 gas stations

Sunoco's new variable octane gasoline required new underground storage tanks at the forty service stations in the vicinity of Newburgh, N. Y. Contractor Ira D. Conklin and Sons was told that each installation had to be *fast*. None of the stations could be shut down during the work... gasoline trucks were actually standing by to fill the new tanks as they were lowered into their excavations.

Since it was necessary to make fast moves with men and equipment from station to station on heavily-traveled streets, the contractor used the highly-portable Gyro-Flo 85 as his primary source of air power. This portable—the only rotary built in the 85-cfm size—provided air for diggers and paving breakers during excavation.

At one station heavy rainstorms caused flooding of an excavation that had already been prepared. A hurry-up call was put through for the Gyro-Flo 85 working at a station some distance away. The compressor was rushed to the scene, hooked up to an I-R sump pump, and dewatering was accomplished while the tank was being lowered into its excavation.

Meeting tight deadlines is a Gyro-Flo habit: the lightweight model 85 matches the larger Gyro-Flo models (up to 900-cfm) in the essential element of dependability under the most demanding job conditions. Ask your I-R distributor for details or write for form 2307.

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CONTRACTORS' COMBINATION

THE BEST AIR EQUIPMENT for BETTER HIGHWAYS

IR

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AN UNBEATABLE COMBINATION... GYRO-FLO COMPRESSORS AND I-R ROCK DRILLS

Pick your favorite with a "Jimmy" Diesel

GM DIESEL ENGINES POWER LEADING MAKES

Ingersoll-Rand
DAVEY
pioneers of air-cooled air
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Since 1859
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OF AIR COMPRESSORS AND WELDERS

TODAY the list of contractors who operate—and manufacturers who build—air compressors and electric welders powered by General Motors Diesels reads like a "Who's Who" of the industry.

Operators around the world have found that these modern 2-cycle Diesel engines pack more power in less space and weight—pick up under load faster than 4-cycle engines—deliver a smoother, steadier flow of power that gets work done faster.

These compact engines are designed for easier, lower-cost maintenance. Unit injectors eliminate complex fuel systems and troublesome high-pressure lines. Smaller size makes the GM Diesel more easily accessible for servicing.

Above all, interchangeable GM Diesel parts make it unnecessary to carry large, expensive parts inventories. In the 71 Series, practically all of the wearing parts are interchangeable *regardless of engine model.* This makes it easy to have the right part available when needed—speeds repairs—gets equipment back on the job with less down-time. And GM Diesel parts cost up to 60% less than comparable parts for competitive engines!

The superior performance and dependability of GM Diesels are backed by a world-wide network of distributors and dealers—with complete parts stocks and service facilities readily available throughout the United States and Canada, as well as overseas.

For more information, consult your GM Diesel distributor or write us.

DETROIT DIESEL ENGINE DIVISION OF
GENERAL MOTORS, DETROIT 28, MICHIGAN

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IT PAYS TO STANDARDIZE ON...

Available in 1485 applications of power equipment built by more than 175 manufacturers

pumping something special?

check these special features

*available with Yeomans Vertical Wet Pit Centrifugal Pumps**

pumping something special?	check these special features
sand glass particles and other abrasives	*Lubri-Vac*® reduces by 95% the failure of bearings due to scoring by abrasive particles. Lubri-Vac constantly flushes bearings with lubricant, keeps foreign matter away. (An exclusive Yeomans feature included on all heavy-duty pumps.)
ash fly ash cinders bits of coal corn foots and other solids contained in drainage	A cradle pump with protective sleeves to protect shaft. Special manganese steel parts. Yeomans pumps including these features will give long life under the most severe abrasive conditions.
potassium cyanide sulphuric acid jet fuel melted naphthalene and other toxic or volatile liquids	Shaft seal is not under liquid pressure with Yeomans Vertical Wet Pit Pumps. This feature eliminates the leakage hazard which is present with horizontal pumps.
molten phosphorous acetic acid hydrochloric acid black liquor and other corrosive liquids	Whatever the corrosive and/or abrasive liquid to be pumped—Yeomans has special ferrous and non-ferrous alloy parts to handle it.

*Vertical Wet Pit Centrifugal Pumps save floor space, require no priming —no costly liquid leaks as stuffing boxes are not under liquid pressure. Capacity range from 5 g.p.m. to 10,000 g.p.m.

YEOMANS PUMPS · GIVE YEOMANS SERVICE

Since 1898

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☐ Please send me the catalog, "Yeomans Heavy-Duty Wet Pit Pumps."

☐ I wish to know how I may see Yeomans' 15 minute film on Wet Pit Pumps.

Name________________

Company________________

Street________________

City________ Zone____ State____

. . . Reader Comment

(*Continued from page 50*)

Prestressing, the unit stress rating of the load cell, hysteresis intelligence, and the exploitation of the straight line portion of the stress-strain curve place the load cell beyond the old "spring" concept.

There admittedly have been moisture problems with electronic scales, however these were not design problems but those of production that dealt with achieving a 100% hermetic sealing of the load cell. Progress has been made to the extent that adverse moisture effects are becoming insignificant.

It should be noted that electrical circuits are particularly adaptable to accurate temperature and moisture compensation.

It is doubtful that Mr. Gehringer can provide substantial data for his "much more frequent failures" of pit components of electronic scales.

My article makes clear that heavy weighbridges are necessary to electronic scales as well as lever systems. The key factor is that long ago it was found more economical to fabricate the weighbridges as near the new scale location as possible.

Eliminating the weighbridges therefore, there are transportation advantages for the light load cell units over the lever scale components.

It is certainly true that the best investment a lever scale purchaser may make is a deep and roomy pit.

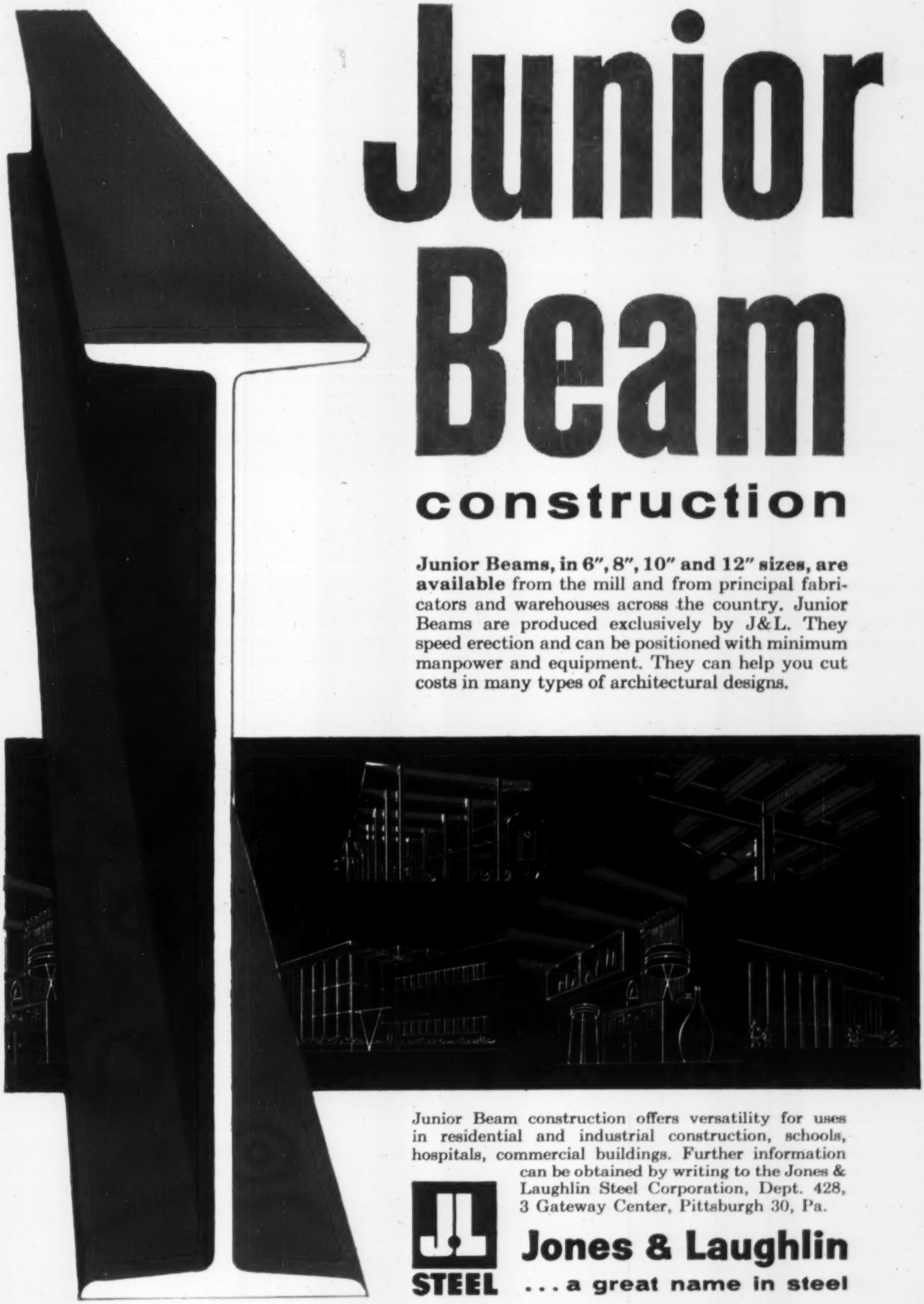
But to get the same utility an electronic scale pit may be somewhat shallower because the entire pit is clear; support columns are required only along the periphery.

A conservative estimate of dollar savings in pit concrete and excavation is $1,774 for a 60 ft pit, down to $300 for an 8 ft pit.

At a recent annual meeting of the Scale Manufacturers Association, Mr. Gehringer made a speech wherein he compared electronic weighing today with aviation in the 1920's. An optimist would be just as correct to compare the electronic scale with the diesel locomotive and the mechanical scale with the steam engine! But this would be no closer to the true present day status of electronic weighing than Mr. Gehringer's allusion.

The electronic scale, a World War II baby, has made serious inroads into the mechanical scale market. I believe that the next ten years will see the ascendency of electronic scales for all platform type weighing as well as process weighing.

J. J. Heatley
Consultant
Smithtown, N. Y.



Junior Beam construction

Junior Beams, in 6", 8", 10" and 12" sizes, are available from the mill and from principal fabricators and warehouses across the country. Junior Beams are produced exclusively by J&L. They speed erection and can be positioned with minimum manpower and equipment. They can help you cut costs in many types of architectural designs.

Junior Beam construction offers versatility for uses in residential and industrial construction, schools, hospitals, commercial buildings. Further information can be obtained by writing to the Jones & Laughlin Steel Corporation, Dept. 428, 3 Gateway Center, Pittsburgh 30, Pa.

J L STEEL

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. . . a great name in steel

KANSAS TURNPIKE Self widener purchased for use on Kansas City, Missouri, Freeway interchanges—built in flexibility made use on Kansas Turnpike equally profitable.

Again Flex-Plane has the nation's number one finisher

For the past three years, contractors have bought more Flex-Planes than all other makes — They will again in 1957... here's why

From the moment the FLEX-PLANE finisher was introduced it has been the favorite of the nation's highway builders. For the past three years it has been in a class by itself—the most versatile, most flexible, most portable and least expensive to operate of any machine on forms.

Now, for 1957, the FLEX-PLANE finisher is even

INDIANA TURNPIKE More miles of Indiana Turnpike were finished with Flex-Plane machines than any other.

NEW JERSEY TURNPIKE Holland Tunnel cutoff had many ramps and intersections. Self-widening feature paid dividends.

TEXAS CITY STREETS Contractor reported highest pouring ever. Credits Flex-Plane. Note amount of concrete in front of screed here.

better! It is more flexible, stronger and faster than ever! Inherent frame design features allow the greatest amount of flexibility—*even as much as 12 to 25 feet in one machine!* And, there is a complete line of FLEX-PLANES to cover any width range desired. Only FLEX-PLANE self-widening offers independent control of extension frames, which means both sides of the machine can be extended or retracted together—*or individually,* for the negotiation of complicated interchange patterns involving variable width and short radius super elevated curves. But, more important, it is the only really proved self-widening machine available today. More than 60 units operating throughout the nation attest to this.

GARDEN STATE PARKWAY Contractor watched machine operate on nearby Route 1 project. Bought immediately.

The FLEX-PLANE carries the largest screeds in the industry-delivering the most satisfactory finish possible. Exclusive butt joint screed design enables screed lengths to be changed faster, easier than ever before. It is completely portable—a flick of the finger and it, instantaneously, becomes its own trailer.

Why not let FLEX-PLANE put you in contact with a FLEX-PLANE user? Talk to him and we are sure you, too, will GO FLEX-PLANE IN 1957!

THE FLEXIBLE ROAD JOINT MACHINE COMPANY
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HORIZONTAL SHORING

FOR ALL BEAM AND SLAB CONCRETE FLOOR FORMS

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Since 1931 Specialists in Engineered Construction Equipment
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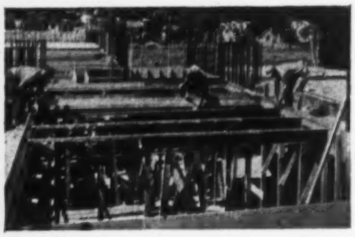
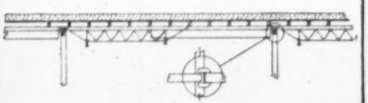
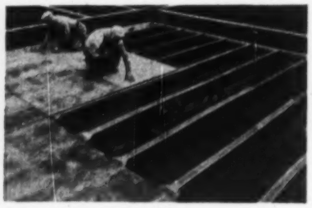


Page 6. Spanall installs fast and easy.



Page 5. Spanall applies to any type of poured concrete construction.



Page 7. Plywood decking laid directly on Spanall.

Newest Catalog features new way to save time, cut costs

Here is practical, profitable information about Spanall, the popular, new, all-metal Horizontal Shoring for concrete forms. Photos, charts and drawings clearly illustrate how Spanall is erected, stripped and stored—with new ease and speed... how Spanall adjusts quickly to any required span length—how Spanall forever eliminates cumbersome, costly vertical shoring... and actually saves as much as 40% in both time and money.

Get *all* the facts about Spanall—it could provide just the competitive advantage you'll need for 1957.

Page 2. Spanall replaces vertical shoring, frees work areas below forms.

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787 United Nations Plaza, New York 17, N. Y.
Gentlemen—Please send, without cost or obligation, ________ copies of the new Spanall Catalog.

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On Yazoo River Basin Project, Yazoo County, Miss.

PIONEER GETS HIGH PRODUCTION FROM CAT* LOWBOWL SCRAPERS

DW20-NO. 456 LOWBOWL SCRAPER is push-loaded by a giant D9 Tractor. LOWBOWL design loads more material with less resistance clear to the end of the loading cycle for quicker heaped loads.

DW21-NO. 470 LOWBOWL SCRAPER speeds heaped load on haul. Turbocharged 6-cylinder Cat Engine, also in the DW20, delivers 300 HP (maximum output)—power aplenty for working in tough conditions.

At the time these pictures were taken, Pioneer Contracting Co., Inc., Memphis, had completed 100 working days of a schedule calling for 600. The project, involving 2,045,000 cu. yd. of earthmoving on the Yazoo River Basin, covers some 7 miles of work on channels, levees, drainage ditches and road relocation. There's a fleet of Caterpillar-built units on the job, including two DW20-No. 456 LOWBOWL Scrapers, a DW21-No. 470 LOWBOWL Scraper and a giant D9. They work 24 hours a day, 5 days a week. Says Pioneer's Scraper Foreman R. C. Parker: "We prefer Caterpillar-built equipment because of ease of operation. You can also depend on them for a minimum of down time. And wherever we are, Caterpillar Dealer service is always available."

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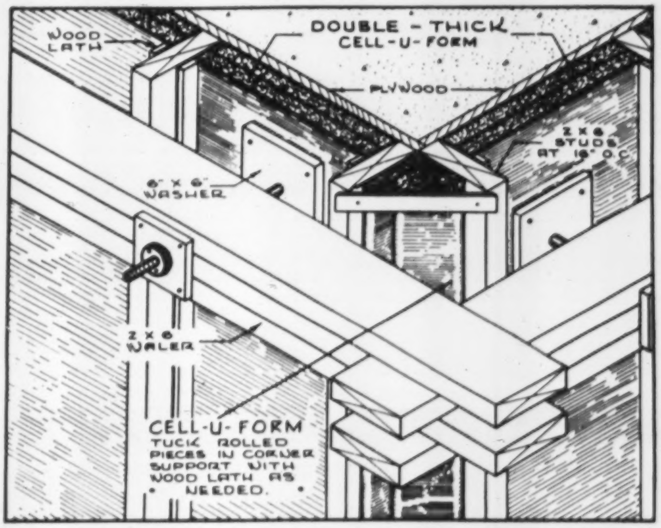
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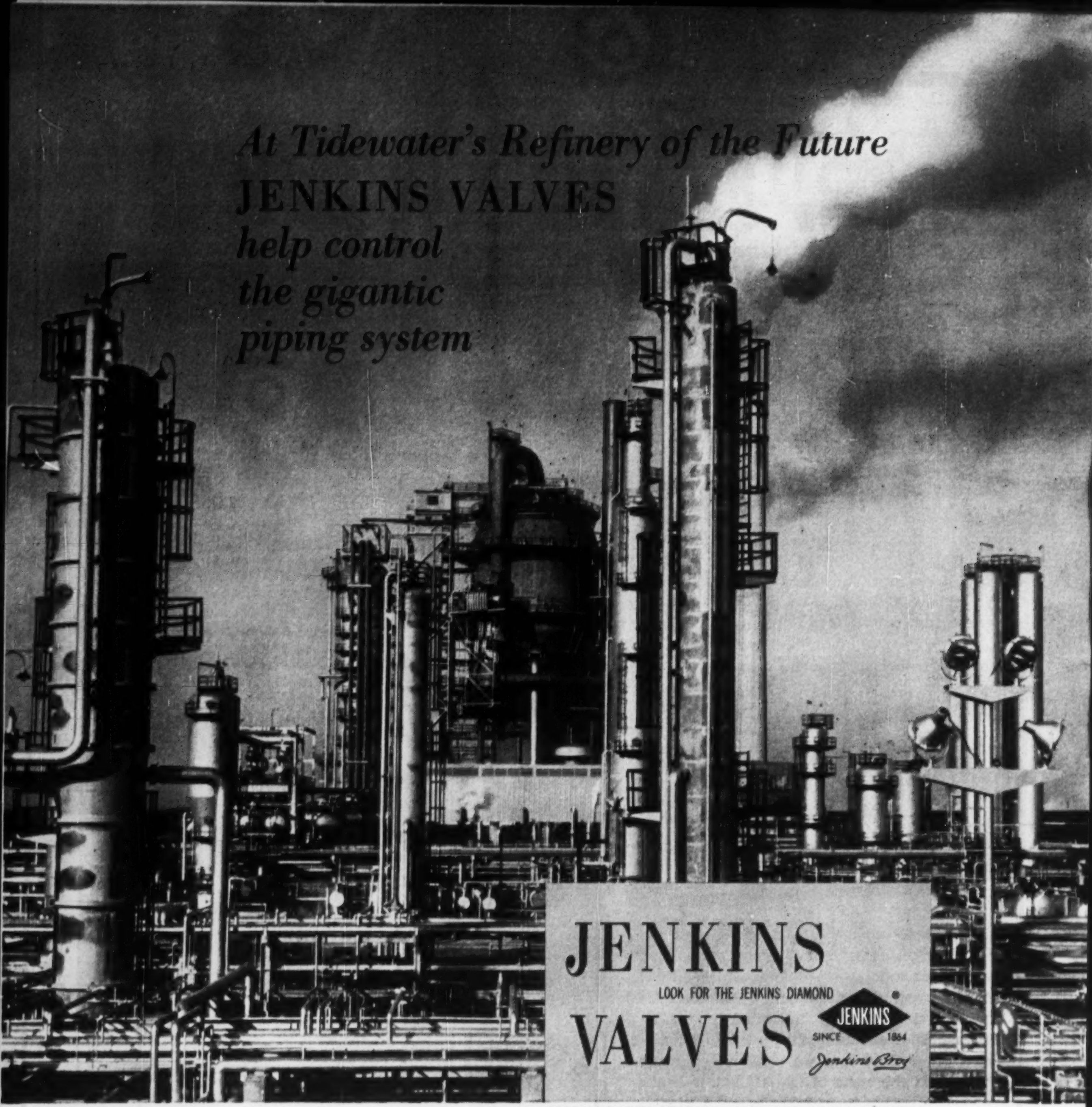

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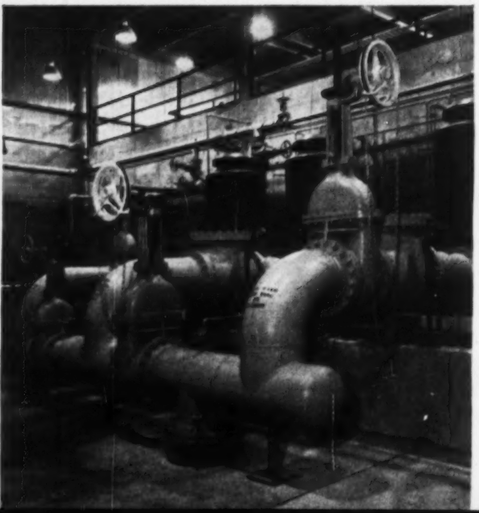

These large valves made of Ni-Resist metal are among the thousands of Jenkins Valves in this great refinery. Sizes range from ¼" to 24"; made of various metals to suit different services.

ENGINEERING NEWS-RECORD

Vol. 159, No.15 October 17, 1957

Number of copies printed this issue, 80,800

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THE CONSTRUCTION WEEK

ORGANIZING REAPPRAISAL?—The annual convention of the American Society of Civil Engineers was launched in New York this Monday with all indications that a thorough, critical appraisal of the organization's performance is in the offing. While the Society's Board of Direction grappled with detailed findings of recent opinion research among the membership, main points of that research were revealed at open sessions of two task committees. The first of these committees—a unit studying ASCE's work toward economic advancement of its members—told that two out of three members want more such activities. The second task committee—on education—stressed dissatisfaction found by the pollsters among ASCE members, engineering deans and civil engineering department heads. If that were not enough the convention delegates including EJC president, Joseph W. Barker, expressed dissatisfaction with the present rate of movement toward unity in the profession (p. 71).

SCHOOL FOR 12 MONTHS—Casting about for ways to increase the facilities for engineering education, a committee of the American Society of Civil Engineers has advanced the idea of revising schedules so that buildings and faculties could be utilized 12 months a year instead of 9 months. But it also recognizes that such a procedure would merely be a stopgap, and that more teachers, better paid, plus a continuing building program constitute the only real solution.

PRICE FIXING—Discount controls on Federal Housing Administration and Veterans Administration mortgages were denounced by Housing Administrator Albert M. Cole as "price fixing in its worst form." Mr. Cole said that because of the limitations placed on FHA-insured and VA-backed home mortgages, "lenders are simply refusing to have anything to do with them," in some sections of the country (ENR Aug. 29, p. 21). He said that such controls have brought back the second and third mortgage. Mr. Cole emphasized that he will advocate repeal of the discount provision enacted by the last session of Congress.

RISING LAND PRICES—The Bureau of Public Roads has balked at paying $22,000 to Rhode Island as the federal share (90%) in the purchase of 31,000 acres of right-of-way previously valued at $11,000 by state appraisers. More than a year and a half after publication of an expressway route the property was sold for $18,000. Subsequently the area was rezoned for industrial use and the same land was sold for $23,000. The last purchaser received a judgment of $24,000 when the land was taken for the expressway.

What Helps Securities Sell?

Allerton C. Hickmott, Vice President, Connecticut General Life Insurance Company, says

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WASHINGTON OBSERVER

- **September housing starts down, but . . .**
- **. . . 1958 looks like a good year**
- **More livable houses for women**
- **Hill group to study federal-aid impact**
- **A 'Grand Plan' for the Southwest**

- **September housing starts dipped sharply, and 1957 is now being finally written off as a relatively bad year.** Official figures show 90,000 actual starts in September, which translates into a seasonally adjusted annual rate of 990,000 for that month. The annual rate was 1,010,000 in August, when builders made 95,000 starts.

  For the first nine months, the adjusted annual rate stands at 973,000. Government experts figure the year will close with about 975,000 starts. Many homebuilders think the 1957 total will be closer to 950,000.

  The industry still is looking for a rebound—to 1 million or more starts —in 1958. Builders foresee more mortgage money being made available. And they plan to pay more attention to the low-price home market, where demand is heaviest.

- **A new survey of homebuilders points to higher production next year, with a new accent on houses carrying smaller price tags.** The National Association of Home Builders has just polled 400 members on their 1958 intentions.

  The 400 are building 26,000 homes this year. Next year, they say they will build about 30,000—or 16% more. Most interesting is their plan for a 45% step up in production of $10,000 to $12,500 homes, a sector that has been virtually ignored for the past couple of years. And they plan 5% fewer new houses next year in the $15,000 to $17,500 range.

- **The womenfolk are keeping pressure on for more livable houses.** Housewife delegates to a Washington "Congress on Better Living," sponsored by McCall's magazine, brought these major guidlines for architects and builders:

  Kitchens. Make them bigger, more flexible—suitable not only for cooking but also for dining, working, hobbying and informal entertaining.

  Lighting. Overhead, built-in systems are preferred.

  Electrical outlets. Put in more, with heavy-duty wiring. Women panelists at the conference wanted outlets set at six-foot intervals in each room.

- **A Congressional committee is cranking up for a study of the economic impact of federal-aid programs, including highways and public works.** The Senate-House Joint Economic Committee will hold hearings Nov. 18-27, under chairmanship of Rep. Wilbur Mills. Panel discussion on the consequences of federal expenditures for highways and other public works is scheduled for 10 A.M. on Nov. 27.

- **A government inter-agency group has come up with a $5 billion long-range hydroelectric development plan for the Southwest.** The proposal would require capital expenditure of $5 billion for 44 hydro projects in a coordinated program on the Arkansas, White and Red River Basins.

  The Senate Public Works Committee released the plan, based on seven years of study by an inter-agency committee created by Congress specifically to study problems and potentials of the Arkansas-White-Red watersheds.

  At this time, the report is a conversation piece and nothing more. Southwesterners will use it to begin a big push for development. But Budget Director Percival Brundage warns in advance that the study is not an adequate basis for authorization of specific programs and projects.

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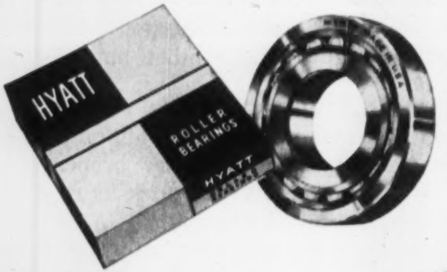
HYATT
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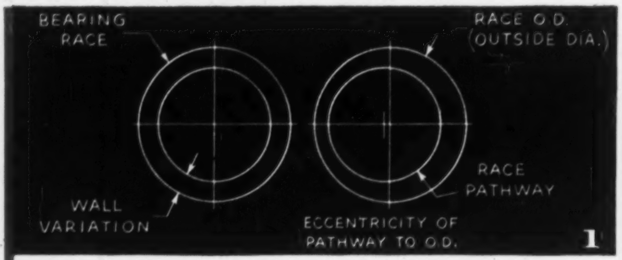
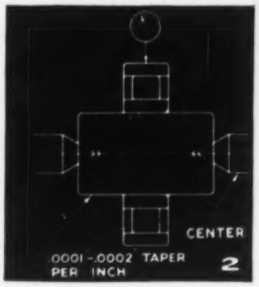

BEARING RACE
RACE O.D. (OUTSIDE DIA.)
RACE PATHWAY
WALL VARIATION
ECCENTRICITY OF PATHWAY TO O.D.
1

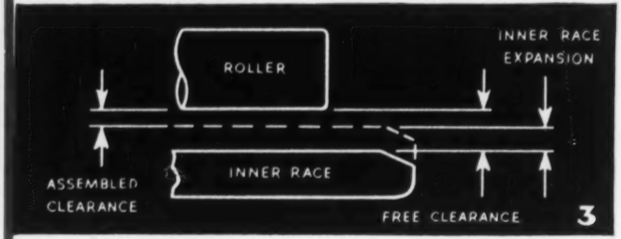
CONCENTRICITY OF RACE DIAMETERS

Concentricity of race diameters is usually defined in terms of wall variation (Figure 1), of the individual races, and radial run-out of the assembled bearing. The latter is generally a user's inspection where the bearing is mounted on an arbor, (Figure 2), having a slight taper (.0001" to .0002" on the diameter per inch of length) and the radial run-out indicated as shown by turning either the arbor or the outer race one revolution while the other member is held stationary and noting the difference between the minimum and maximum readings. Industry standards are available which indicate what values are acceptable.


CENTER
.0001-.0002 TAPER PER INCH
2

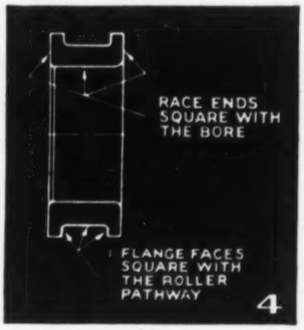
UNIFORMITY OF ROLLER DIAMETERS

Roller diameter uniformity, which is also necessary to running smoothness, is obtained by segregating the rollers into diameter variation classes of .00005", .0001" or .00015", depending on bearing size and quality grade and assembling only rollers of the same class into a given bearing. Rollers are then matched with races which are segregated in a similar manner in order to control the diameter over or under the rollers, which governs the internal clearance spread of the mounted bearing. (Figure 3 magnified)


ROLLER
INNER RACE EXPANSION
INNER RACE
ASSEMBLED CLEARANCE
FREE CLEARANCE
3

SQUARENESS OF RACE AND ROLLER ENDS AND FLANGE FACES

Figure 4 indicates the race surfaces which must be square with each other within minute tolerances depending on the grade of the bearing. This is to prevent roller skewing with consequent heating and noisy operation. The roller ends must also be square with the diameter for the same reason. End square tolerances are usually less than .001" for the most frequently used sizes.


RACE ENDS SQUARE WITH THE BORE
FLANGE FACES SQUARE WITH THE ROLLER PATHWAY
4

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OCTOBER 17, 1957

ENGINEERING NEWS-RECORD

Mexico City's cracked buildings lead to building code changes that tell . . .

How to Reduce Seismic Damage

Earthquake provisions in the building regulations for the Mexico City area are being changed as a consequence of the July 28 temblor. The new requirements are much more conservative than the old ones, which were promulgated in 1942.

The revision calls for higher design coefficients for computing seismic shears and assumes linear variation of accelerations in determining shears at various levels. It places limits on deflections. It incorporates provisions for torsional resistance. In addition, it requires that consideration be given to subsurface conditions, type of occupancy, height of building and type of construction in selecting seismic coefficients.

• **Post-quake activity**—The cities of Mexico, Acapulco and Chilpancingo were badly shaken by the July 28 earthquake. Most of the damage occurred in Mexico City (ENR Aug. 15, p. 38), which has grown at such a rate in recent years that it has become nearly synonymous with the Federal District. (Mexico City operates under the Federal District building code.)

• **Many consulted on revision**—In working out new criteria for a seismic design the Federal District Office of Public Works consulted its permanent building committee, as well as a number of consulting engineers and research professors of the Institute of Engineering, National University of Mexico.

In addition, committees were formed to gather and appraise data on the earthquake effects. Their early findings served as a basis for code modifications.

When the old code was drafted in 1942, it was up to date according to standards of that time, except that many engineers considered the seismic design coefficients adopted too low. However, the only severe quake the committee on regulations was aware of was that of 1941, which was weaker than the July 28 temblor. Also, there were fewer tall structures in Mexico City then.

• **Emergency rules**—The OPW calls the new regulations "Emergency Rules to Verify the Stability of Buildings Subjected to Seismic Action." In a preamble the OPW states:

"Due to the earthquake that occurred July 28, 1957, important damages were sustained in a very high number of structures of different types, found mainly in the low part of the city, where the subsoil is formed by materials of low resistance and high compressibility. Having in mind seismic experience in other regions of the world and the preliminary analysis of the damages caused by the earthquake, as far as distribution and magnitude of the more probable accelerations in structures is concerned; the influence of the mechanical properties of the subsoil on the extent and duration of ground vibrations; existence of a predominant frequency in the soft subsoil; contribution of partitions to the rigidity of structures and their action as energy dispersers; breakage of structural components due to the collisions between adjacent structures that vibrate in different periods; and the possibility of destructive earthquakes striking buildings

. . . How to reduce seismic damage

supported on bearing walls where the ground is rigid and yields very little, the Office of Public Works has formulated the following rules . . .

"These are of a provisional nature and will be applied until they are replaced by more adequate and complete specifications, which will result from a careful and well documented study of the behavior of the structures that were subjected to seismic action."

The emergency rules apply to all buildings, including one-story dwellings, whereas the old code exempted buildings less than 53 ft high.

Following the characteristics of the subsoil, Mexico City is divided into three principal zones—Zone A, lake bottom; Zone B, transition; and Zone C, hills—as indicated on a map.

Taking into account type of occupancy, buildings are classified into three groups—**a**, **b** and **c**. For example, hospitals, theaters, schools and other important buildings are included in group **a**, small houses in **c**.

In addition, buildings are classified in accordance with structural characteristics:

Class alpha—Concrete or steel structures with partitions that contribute to increased rigidity, properly bonded and distributed.

Class beta—Concrete or steel structures that do not have elements foreign to the structure that contribute to increased rigidity. Bracing and concrete walls firmly attached to the structure are considered integral parts.

Class gamma—Structures supported only by bearing walls.

- **Shear calculations**—In accordance with these classifications, seismic design coefficients are given in an accompanying table. The coefficients multiplied by the total load on the foundations (with live load reduced as permitted for columns) yield the base shear at foundation level.

In contrast to the provisions of the present building code, the new coefficients are dependent on type of structure and nature of the ground. They range from two to four times present values. In addition, to estimate the lateral forces acting at each floor level, seismic accelerations are assumed to vary linearly from zero at foundation level to a maximum at the roof, similar to the requirement in the San Francisco building code. (See also ENR Dec. 1, 1949, p. 28.) Up to now, most Mexico City structures were designed for a constant 0.025g.

Parapets, billboards, ornaments, exterior walls and front facings should be considered subject to a uniform acceleration of at least 0.5g. And stability of inside walls should be checked for a uniform acceleration of 0.1g.

The emergency rules restrict relative displacement between braced points of columns or walls, such as at floor levels, to 0.2% of the distance between those points. Also, a study should be made to determine the necessary separation between adjoining, independent structures or at expansion joints to prevent damage due to collisions during an earthquake.

- **Safe working stresses**—Instead of the one-third increase in working stresses formerly allowed, much larger values are permitted for a combination of earthquake, live-load and dead-load stresses. For concrete, the stresses specified in the American Concrete Institute building code can be doubled, except for diagonal tension, for which the increase remains at 33%. Reinforcing bars of mild steel may be stressed to 90% of the yield point and special steel grades to 80% of the elastic limit.

Sections may be checked by limit-load theory, with a safety factor of 1.2 in flexure and 1.5 for axial load.

Structural steel will be permitted combined stresses up to 1.5 times the safe working stresses specified by the American Institute of Steel Construction. However, sections may be checked by limit design with a safety factor of 1.0 in flexure and 1.3 for axial load.

To account for accidental torsion that might occur in an earthquake, a moment should be applied equal to the product of 5% of the horizontal shear and the maximum dimension of the floor being analyzed, measured normal to the shear. For warehouse floors, the factor should be increased from 5% to 7%.

Provision is also made in the emergency rules to protect structures against torsional oscillations.

- **Criticism**—Reaction to the new rules by Mexican engineers has not all been favorable. Some of the most experienced engineers consider the new coefficients too low. Others consider them too high, claiming that it is not economically feasible to design a building 12 or more stories high.

Replies one prominent consulting engineer: "This is not so. The design of several new tall buildings has been successfully achieved with no more than 2% or 3% increase in overall construction cost. Even the reinforcing of damaged buildings has been found economical in most cases, and a 30% reduction in the design coefficients puts all damaged buildings within economical repair range."

However, this engineer also points out that the methods of analysis proposed still are static, not dynamic, though the manner in which the coefficients are assumed to vary is closer to the results obtained with dynamic analysis than the assumptions of the old code.

Building officials believe that insufficient information is available at present to permit them to specify dynamic analysis; too little is known about natural vibration periods of structures and about the characteristics of strong-motion earthquakes in the Mexico City valley. Research is under way at the Institute of Engineering, National University of Mexico, with the objective of finding a rational solution to the problem of seismic analysis.

Another prominent Mexican engineer, while agreeing with the theory of dividing the city into zones, disagrees with the method adopted. He says it would be better to base the zones on the compressibility of the subsoil in accordance with soil-mechanics studies. Also, he argues, the structural classification of buildings and the seismic design coefficients should be based on dynamic analysis, considering the vibration periods.

This engineer also considers it unreasonable to allow for combined loading double the live and dead-load allowable stresses, since the actual strength of materials is ignored. He considers incongruous the provision for concrete that permits only a 33% increase for shear but 100% for other stresses. He is also critical of the rules for steel that allow a 50% stress increase, while concrete is allowed twice as much. And for spread footings, he considers the concept of bearing capacity vague, subject to the particular criterion of soil mechanics adopted.

Despite the criticism, the Federal District Department is proud of its amendments to the old building code.

Minimum Values of Seismic Design Coefficient

Group	Building Class	Zone A	Zone B	Zone C
a	alpha	0.15	0.13	0.12
a	beta	0.20	0.18	0.15
a	gamma	0.15	0.18	0.20
b	alpha	0.07	0.06	0.05
b	beta	0.10	0.09	0.07
b	gamma	0.07	0.09	0.10
c	α, β, γ.	0	0	0

Corps Details Year's Spending

New military construction projects of the Department of the Army moved one step nearer the bidding stage late last week.

The Army told the Secretary of Defense how it proposes to allocate funds to specific projects from the $310 million voted by Congress, for new Army construction in fiscal 1958.

A line-item breakdown distribution of funds is an essential preliminary to actual allotment of new go-ahead authority from the Budget Bureau. The Army's list of requested dollar amounts for spending commitment was the first to reach the Defense Department from the three services. Navy and Air Force requests will follow within a month. The Defense Department has to review and approve the requests before they go to Budget for final review and release of funds.

Army construction plans had to be adjusted downward from $325 million asked by Congress. No total figures are available of the money request for new construction submitted to the Defense Department.

Some of the cuts and deferments in the planned program presented to Congress in early July obviously were necessary.

Major spending commitments to projects on which U.S. contractors will bid are listed below. These figures cover estimated total construction cost of the proposed work. Estimated value of the contract construction on which bids will be asked ranges generally from 85% to 95% or more of the total.

Bid calls and contract awards for military construction are continuing without interruption while the new fiscal 1958 requests are being prepared and approved. The Budget Bureau promptly released $700 million of unobligated carryover funds remaining to the military at the end of fiscal year 1957 on June 30 (ENR Sept. 12, p. 19).

A big backlog of carryover funds was built up during the Korean emergency. This backlog has now been pretty well used up, and the Army this year is dependent on fiscal 1958 authorizations and appropriations for most of its new military construction awards. Last year, by comparison, only $55 million of new money was voted to the Army in the regular appropriation bill, and that sum was for Army Reserve Forces construction. The same law transferred $202 million to Army construction from previous service appropriations.

New Army Construction Starts

(Projects to be started during the year ending next July 1)

Project	Total Cost
Aberdeen Proving Grounds, Md., buildings	$2,288,000
Anniston Ordnance Depot, Ala., R.R. spur & roads	2,015,000
Atlanta General Depot, Ga., hangar and facilities	1,579,000
Fort Belvoir, Va., hangar, shops, aprons	3,058,000
Fort Benning, Ga., two hangars	2,005,000
Fort Bliss, Tex., hardstands, missile lab	12,574,000
Fort Bragg, N.C., two hangars, shops, aprons	2,049,000
Cold Regions Laboratory, N. H.	2,496,000
Fort Detrick, Md., utilities & fence	627,000
Fort Devens, Mass., hangars, shops, aprons	913,000
Fort Eustis, Va., buildings	1,649,000
Family housing at tactical sites	3,736,000
Family housing at tactical sites, Alaska	4,910,000
Fitzsimmons Army Medical Center, Colo., building	937,000
Fort Worth General Depot, Tex., hangar, apron	1,553,000
Fort George G. Meade, Md., hospital, hangar, aprons	5,444,000
Fort Hood, Tex., shops, hangar, buildings, aprons	3,531,000
Fort Huachaca, Ariz., barracks, hangar, shops	3,192,000
Fort Knox, Ky., shops, roads, buildings	6,187,000
Ladd Air Force Base, Alaska, family quarters	1,878,000
Fort Leavenworth, Kan., hospital, buildings	5,492,000
Fort Lee, Va., barracks, buildings	3,171,300
Fort Lewis, Wash., hangar, maintenance shop	2,620,000
New Cumberland General Depot, Pa., hangar, aprons	1,095,000
Fort Ord, Calif., hangar, shops, apron, utilities	3,449,000
Redstone Arsenal, Ala., shops	1,041,000
Fort Richardson, Alaska, family housing, roads, hangar	6,447,000
Fort Riley, Kan., barracks, hangar, buildings	3,353,000
Fort Ritchie, Md., two barracks	820,000
Fort Rucker, Alabama, eight barracks, aviation facilities	10,748,000
Savannah Ordnance Depot, Ill., R.R. siding, platforms	758,000
Sharpe General Depot, Calif., hangar	765,000
Fort Sill, Okla., school building, elec. & commun. bldg.	5,798,000
Camp Kilmer, N. J., maintenance shop	2,381,000
Camp Hanford, Wash., three shops	1,045,000
Camp MacArthur, Calif., three shops	1,192,000
U. S. Military Academy, N. Y., building conversion	3,466,000
Walter Reed Medical Center, D. C., air-conditioning	5,375,000
White Sands Proving Ground, N. M., buildings	16,605,000
Wildwood, Alaska, buildings	1,221,000
Continental U. S., classified locations	22,685,000
Continental U. S. classified locations air defense facilities	115,000,000

Professional Unity

President Joseph Barker gives EJC's viewpoint

The president of Engineers Joint Council this week called for "sound engineering analysis" on the problem of achieving professional unity. And the made it clear that he thinks little of the "tri-partite" confederation recently suggested by the American Institute of Electrical Engineers (ENR July 18, p. 37).

Joseph W. Barker, speaking before Monday's Unity Luncheon at the annual convention of the American Society of Civil Engineers, went so far as to suggest an engineers' convention out of which might be formed a true unity organization, an "American Society of Engineers."

The EJC president traced development of the engineering profession, beginning as it did with military, then civil engineers, then splintering into the many existing engineering societies and institutes.

He covered the organization of Engineers' Council for Professional Development for work in fields of engineer recruitment, education and training; traced the history of licensing of engineers, which has led to "a most confusing situation" of differing state requirements for license and lack of reciprocity; recalled work of the unity committee that led to formation of Engineers Joint Council, with only the National Society of Professional Engineers voting against.

Citing NSPE's continued requirement that only licensed engineers be members, Mr. Barker contended that individuals who are members of EJC constituent societies are "qualified by education and experience for a license, whether they have one or not."

"One activity desired by some, even many, engineers relates to legislation. . . . Here we enter an area of legal quicksand," he said. EJC is struggling for the tax status of an educational institution, so as not to jeopardize the tax status of its constituent societies. It can advise on governmental policies, if asked, but can't propose legislation.

Mr. Barker admitted that present organizations are not meeting the need for unity, nor are they serving the entire profession. "We have muddled along with EJC, ECPD and NSPE," he said, "yet, we are moving, slowly to be sure, in (the direction of unity) and it will come eventually."

Columbia Basin Development Includes

The necessity for a favorable agreement with Canada to realize fullest development of the Columbia River Basin shows up as an extremely important factor in a recently released report by the U.S. Corps of Engineers.

The report is a summary of preliminary findings of the Corps' review of the original "308" study—the comprehensive water resources development plan for the basin presented in 1948.

The report—being circulated preparatory to public hearings this month and next—includes a compilation of new multipurpose storage projects necessary for resource development at four different levels, the first three excluding Canadian projects.

Minimal development, Level 1 (see table) would run to $900 million, provide a total flood control storage of 19.2 million acre-ft, and make possible 3 million kw of added power. Level 2 (omitted along with 3 from table) would cost $1.2 billion, provide total control storage of 24.7 million acre-ft, and account for 4.4 million kw more power. Level 3 features $1.7 billion, 30.7 million acre-ft, and 5.4 million kw.

However, these three levels would not be as complete a development as possible. More nearly full development of the basin is at Level 4—and this involves Canadian projects. U.S. cost for Level 4 would run to $1.8 billion, which would provide 39.5 million acre-ft of total flood storage, and have an added U.S. power potential of 6.5 million kw.

Full cooperation and participation of both the U.S. and Canada has for years met one stumbling block in the form of Canada's proposed Mica project. At last count, Canada was planning to go at this project in its own way. And its own way includes diverting part of Columbia River water to the Thompson-Frazer river system in Canada—a feature to which the U.S. objects strenuously (ENR Aug. 23, 1956, p. 21).

Another part of basin wide development that the U.S. and Canada are, at present, in controversy over is Libby Dam in the U.S. This project, if built as planned, would back up water into Canada. To inhibit this would be to not fully utilize the site's potential.

While both Canada and the U.S. have strong arguments for their respective positions on the matter, it is hoped that an agreement will be worked out before the final report of the review comes out, some time next year.

• "308" still holds—No significant changes were found by the preliminary investigations in the basic requirements for flood control set down in the original report of 1948. One change has been made in the previous requirement of 21 million acre-ft of usable flood storage to control the 1894 flood—with its flow of 1.2 million cfs—to 800,000 cfs at The Dallas Dam.

This figure has been scaled down to 19 million acre-ft, following reanalysis and increase of the effect of irrigation diversions on reduction of flow during flood periods. At present, a total of approximately 10 million acre-ft of storage is available or reasonably assured.

• Thermal generation—The report predicts a power change within the next 40 years for the Pacific Northwest, wherein the system will go from an all hydroelectric to one supported largely by thermal generation of power.

The Federal Power Commission forecasts power requirements for the Pacific Northwest at 10 million kw in 1965, 23 million kw in 1985 and 39 million kw by the year 2000. Power requirements for 1955 were 4.9 million kw.

To meet these loads, it is predicted that requirements for 1965 can be met by addition of hydroelectric projects now under construction or scheduled for early construction.

But from then on, thermal generation will become an important factor. For the 1985 load, one-third will be supplied by thermal means. And for the year 2000 load, the figure will be two-thirds.

• Navigation—The report also deals with the economic feasibility of a num-

With and Without Canadian Projects

(Two all-U.S. intermediate levels, at $1.2 and $1.7 billion omitted)

Stream	United States Projects Only Level 1		Including Canadian Projects Level 4	
	Project	Flood Control Storage in millions of acre-ft	Project	Flood Control Storage in millions of acre-ft
Columbia River in Canada			Mica Creek	10.90
			Arrow Lakes	1.20
Kootenai River			Libby	5.01
	Long Meadows	.40	Long Meadows	.40
Clark Fork and Spokane Rivers	Ninemile Prairie	.72	Paradise	4.08
	Spruce Park	.30	Flathead L. outlet	.50
	Buffalo Rapids	.67	Enaville	.65
	Flathead L. outlet	.50	(Hungry Horse)	2.29
	Enaville	.65		
	(Hungry Horse)	2.29		
Snake River above Salmon River	(Upper Snake)	1.76	(Upper Snake)	1.76
	(Brownlee)	1.00	(Brownlee)	1.00
	Garden Valley	.60	Garden Valley	.60
	Pleasant Valley	.50	Pleasant Valley	.50
Salmon and Grande Ronde Rivers			Lower Canyon	2.30
	Wenaha	.90	Crevice	1.70
			Wenaha	.90
Clearwater River	Bruces Eddy	1.40	Bruces Eddy	1.40
	Penny Cliffs	2.30	Penny Cliffs	2.30
Main stem Columbia River	(Grand Coulee)	4.20	(Grand Coulee)	1.50
	(Priest Rapids)	.50	(Priest Rapids)	0
	(John Day)	.50	(John Day)	.50
Total Flood Control Storage (Millions of acre-ft)		19.2[1]		39.5[1]
Control of 1894 flood at The Dalles, Oregon		800,000 cfs		590,000 cfs
Power Storage (Millions of acre-ft)		20.7		49.1
Dependable Capacity added at 70% load factor (kw)		3 million		6.5 million[2]
Cost of new storage projects		$900 million		$1.8 billion[3]

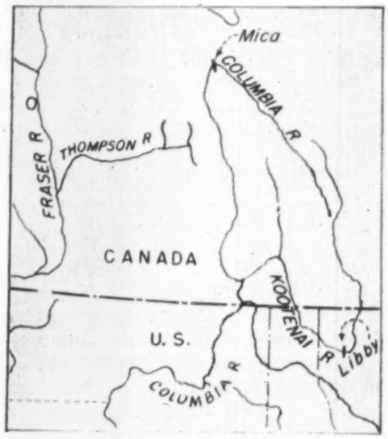
( ) Denotes project existing or under construction.

[1] Net diversions for irrigation not included. For control to 800,000 cfs this amount approximates 2.9 million acre-ft.

[2] Does not include power generated in Canada

[3] Does not include cost of Canadian projects

Canadian Jobs



TWO AREAS OF CONTROVERSY, Mica and Libby, must be settled for the fullest Columbia River Basin development.

ber of navigation features of the area.

The study was favorable to extending navigation to the foot of Rock Island Dam, near Wenatchee, Wash., by means of open channel improvements and installation of locks at Priest Rapids and Wanapum Dams. Extending slackwater navigation on the Snake River to Lime Point, Idaho, by means of Asotin Lock and Dam also is considered feasible.

The report was against a new lock at Bonneville, and the feasibility of a 40 ft channel from Portland and Vancouver to the mouth of the Columbia River is to be determined after survey and study.

All phases of development planning, including flood control, navigation, power, and other water resource uses outlined in the report, will be covered in the public hearings, according to Brig. Gen. L. H. Foote, North Pacific Division Engineer. The hearings will be held in Missoula, Mont., Oct. 21; Wenatchee, Wash., Oct. 23; Lewiston, Idaho, Nov. 13; and Portland, Ore., Nov. 15.

Pulp Mill Finally Gets Waste Discharge Permit

The Washington State Pollution Control Commission has granted a five year permit to the Shelton pulp mill of Rayonier, Inc., to dump waste waters into an arm of Puget Sound.

Last month, the commission had denied the Rayonier application on grounds the effluent was damaging marine life, but since then has been assured that Rayonier can dispose of 97% of its waste by evaporation and burning. The mill currently is closed down and no plans have been announced for its reopening in the future.

The commission also has received a report from the State Fisheries Director which asserts that his department has "positive proof" that sulphite waste liquors are harmful to marine life. Salmon fisheries are in a "very desperate position" and are "waging a losing battle" as a result of the discharge of these liquors into the waters of Puget Sound, he said.

Honeymoon Over

Power spokesman stirs Missouri River conflict

The power vs. navigation fight in the Missouri Basin, which has been smoldering for many a year, flared into the open before the Missouri Basin Inter-Agency Committee at a recent meeting in Helena, Mont.

It came when the meeting, called to take a look at the utilization of Missouri River water under the Pick-Sloan Plan, heard a demand that more water be used to generate power and less be used for navigation.

The demand was voiced by Virgil T. Hanlon of Madison, S. D., manager of the East River Electrical Co-operative and a spokesman for the viewpoint of the politically potent rural co-operatives. It was Rural Electrification Administration pressure that prompted legislatures of Montana, North Dakota and South Dakota to memorialize Congress to investigate what was described as a "criminal waste" of Missouri River water by Army Engineers. And the opposition of South Dakota electrical co-operatives was credited with nearly bringing about the defeat of Sen. Francis Case at the last election.

Mr. Hanlon called for giving preference customers a voice in the allocation of Missouri River water for its various uses; priority of Missouri River water for the generation of power; a centralized management plan for the basin program ("Personally, I favor a Missouri Basin Authority"); slack water navigation of the lower Missouri by a series of locks and dams (the theory is that this would require less water than is required by the present open channel, thereby making more water available for power); and putting the Bureau of Reclamation into the utility business by permitting it to erect thermal generating plants, using the huge lignite deposits of the Dakotas as fuel.

"The 14 year honeymoon of the Pick-Sloan marriage is over," he said. "The fight between the upper basin states and the lower basin states is now in the open. . . . The controversy can be summed in a simple statement as free-flowing navigation vs. irrigation and electric energy."

The Inter-Agency Committee considered the problem with a full awareness of the gravity of its implications. Power is of primary importance to the upper basin states, which need it to attract industry and thereby stabilize a precarious agricultural economy. The lower basin states, which do not share in the hydro power from the Missouri River dams, see navigation as a key to their development. A power vs. navigation fight would pit the upper basin against the lower basin in a fight in which both would suffer.

Inter-agency speakers answered Mr. Hanlon but their remarks were addressed to the Missouri Basin in an effort to win public opinion to a viewpoint that all must share the river's water if all are to benefit.

These points were made:

- The meetings of the Missouri River Co-ordinating Committee, which allocates Missouri River, will be opened to the public so that special interests can express a viewpoint.
- In setting up the Missouri Basin program, Congress gave priority of water to consumptive use, irrigation and navigation. Power was regarded chiefly as a by-product.
- Power generation has been hampered by three years of drouth and the necessity to fill the new reservoirs. With a gain in storage, a return to a normal weather pattern and installation of additional generators, power should be in more ample supply.

Three governors—Wyoming's Milward Simpson, South Dakota's Joe Foss and North Dakota's John E. Davis—voiced their opposition to the authority type of management for the basin.

State Seeks Close Check On Costly Right-of-Way

Tennessee State Highway Commissioner W. M. Leech has called on his department's 300 engineers to report to him any instances in which proposed right-of-way prices appear excessive.

"I'm determined that there will be no scandals in Tennessee's highway building program and that is why I am stressing this matter now," he said. "In a few months the department will be acquiring millions of dollars worth of property for the new highways and I am going to do everything possible to prevent such scandals as have been reported in some of the other states."

Commissioner Leech pointed out that one of the greatest dangers to the program is that speculation will get out of proportion with the real value of property. "We want landowners to have a fair price for the property we acquire for rights-of-way, but we don't want them to speculate on land to the point that the price will be out of reason."

A Glowing Forecast for Sewage Construction

"Undoubtedly the best data available" on the outlook for sewage treatment construction in the U. S. through 1960 was unveiled last week at the 30th Annual Convention of the Federation of Sewage & Industrial Wastes Association in Boston.

In preparation for a panel evaluation of the federal construction grants program for sewage construction, Blucher A. Poole, Curtiss M. Everts and David B. Lee, state sanitary engineers of Indiana, Oregon and Florida, analyzed questionnaires they sent to all 48 states concerning construction prospects.

Their verdict for the 48 states, based on replies from 40: Estimated construction of interceptors and treatment plants (laterals or branch lines, whose construction is not eligible for federal aid, are not included) for the years 1958, 1959 and 1960 totals a whopping $1,766 million.

Individual years break down in order to $550 million, $470 million and 746 million, at current prices. Construction in the interceptor and treatment plant categories in the years 1953, 1954, 1955 and 1956 as compiled by the U. S. Public Health Service was $203 million, $195 million, $253 million and $300 million, respectively.

Second objective of the survey was to shed some light on the adequacies, or inadequacies, of the current $50 million a year federal-aid program. If all prospective projects, 3,160 of them, were to receive federal aid in the amounts allowed ($250,000 or 30% of project cost, whichever is lower), the federal share would come to twice the amount authorized for the next three years. The survey also showed that some states could use four times the federal money that will be available for projects therein, while other states will require only one-quarter of available funds. (The $50 million pie is split among states on the basis of population and per capita income.)

The surveyors concluded: Either a federal loan program should be substituted for grants in aid, or the present laws should be amended to increase the federal-aid authorization and a "readiness to go" factor should be introduced to funnel more money into states that can use it.

The panel to evaluate whether the current program was "accelerating" or "retarding" anti-pollution construction didn't do much evaluating on the grounds that it was still too early. However, informal discussion by representatives of a number of states corroborated ENR's analysis of the program after one year's operation (ENR Aug. 15, p. 25): Federal-aid definitely was stimulating construction.

The final panelist, Gordon F. McCallum, chief of the PHS pollution control program, devoted his time to the somewhat neglected remainder of the 1956 Water Pollution Control Act (P.L. 660). With increased operating and research funds made available by the new law, PHS is tackling the crucial business of putting a dollar value on pollution and pollution control. Research contracts have been let to Stanford University and the University of Chicago.

Pollution controllers have long contended that with reliable monetary figures to present to the public, any resistance to an anti-pollution measure would dissolve.

• **Combined treatment**—The FSIWA convention, attended by 1,325 including wives, produced numerous predictions of an accelerated trend toward combined treatment of industrial wastes and domestic sewage in municipal plants. These were accompanied by warnings that even so-called "amenable" industrial wastes will be often troublesome to handle.

Formal case for combined treatment was made by Leon S. Kraus, manager of the Greater Peoria Sanitary District, Ill. Combined treatment could benefit the public by: (a) providing better total treatment (effluent from combined treatment would often be poorer than from domestic sewage alone, but industrial wastes would be treated to a higher degree than possible if they were treated separately by each industrial producer), (b) enabling treatment of many industrial wastes with high toxic concentrations, which are not susceptible of treatment alone, and (c) bringing in additional revenue to offset the cost and operation of municipal plants.

Mr. Kraus summarized the advantages of combined treatment to industry as: lower annual cost; better public relations (any odor problems would be the responsibility of the municipal plant); less capital investment required compared to building its own treatment facilities; and freeing of space required by treatment plant for other uses.

• **Revised sludge disposal economics**—A description of "spectacular" results with experimental chemicals to aid in concentration of sludge solids provoked comment that the entire economics of sludge disposal would undergo wholesale revision.

Robert D. Bargeman, lab director of Los Angeles' Hyperion plant, told of experimental chemicals—synthetic organic coagulants—that when added to digested and elutriated sludge, enabled

Watson Is New FSIWA President

The election of Kenneth S. Watson, of the General Electric Co., as president of the Federation of Sewage & Industrial Wastes Association at the above meeting marks the first time in the 30 year history of the federation that an industry man has been at the helm. His assumption of the office promises to give more substance to the partnership between industrial and municipal waste treaters, a partnership that in the past has sometimes produced more lip service than interchange of information.

Perhaps the most immediate problem facing the federation is how better to serve and appeal to the operators of small and medium size disposal plants. On the individual association level (usually by state) the operators' needs are being served reasonably well, Mr. Watson feels, but the national federation has overconcentrated its publication and convention efforts on highly technical materials. He intends to encourage recent efforts by the federation to remedy the situation: The Operator's Corner in the Journal and the operators forum held last week in Boston.

Prior to assuming his coordinator of waste treatment post with General Electric in 1950, Ken Watson was executive secretary of the West Virginia Water Commission. He had joined the commission in 1936 after receiving from West Virginia University a masters degree in chemical engineering.

subsequent vacuum filters to increase their yield of concentrated sludge cake from 1 to 2 lb per sq ft of filter even to a spectacular 20 lb per sq ft. And, he added, yields of 40 to 50 lb per sq ft were feasible. Unfortunately, neither of the two chemicals are yet available commercially and the impressive research at Hyperion must cease since the vacuum filters there will soon be discarded in favor of the recently laid seven-mile digested sludge outfall (ENR July 28, p. 33).

Discussers admitted that even the high order vacuum filter yields now in the offing would not compete economically with submarine outfalls as a method of sludge disposal. But the new sludge coagulants, if made available in quantity and proved in large-scale use, could very well enable vacuum filtration to compete with barging sludge to offshore disposal sites. Or, for inland areas, cheaper vacuum filtration would enhance sludge-to-fertilizer economics.

• **Detergents the culprit**—In characteristic energetic manner M.I.T. Prof. Clair N. Sawyer went way out on a limb before the convention by pinpointing one class of household synthetic detergents (syndets) as the cause of the frothing in activated sludge plants and as an inhibitor of self-purification action of streams under turbulent flow conditions. Frothing or foaming lowers quality, increases air requirements and is unsightly.

Prof. Sawyer characterized the culprit syndets as those which are biologically "hard" (not susceptible to biological stabilization) and called upon manufacturers to substitute biologically "soft" surfactants (which are expensive, apparently). The so-called hard syndets, such as alkyl benzene sulfonate, are used in about 60% of synthetic household detergents on the market, he estimates.

Prof. Sawyer also cleared syndets of many other crimes that have been attributed to them—such as interference with settling or grease removal in primary treatment and difficulties in vacuum filtration of sludge.

A representative of the American Association of Soap & Glycerine Producers replied of Prof. Sawyer's charge that AAS&CP-sponsored research has thus far failed to fix responsibility solely on syndets.

Corporate Engineering Blocked

The long-standing debate over corporate practice of engineering erupted last week after the Idaho Board of Engineering Examiners filed suit in a state court to prevent completion of a state-sponsored engineering contract.

The board contended in its action before the State District Court in Boise that the State Highway Department and its officials had acted illegally in signing a contract with the Karl F. Tuttle Engineering Company, Inc., of Alameda, Calif., for $120,046 worth of engineering work on 38.6 miles of interstate highway between Blackfoot the Basset.

The contract could not be legal, said a court brief, because corporations cannot practice in the state, since they cannot qualify for registration as engineers. Only individuals can so qualify, attorneys for the board claimed. Additionally, the examining board charged that the contract document did not include the word "incorporated" in the name of the engineering firm; and that a licensed Idaho engineer was designated as vice-president of the company, and a signature line for him was added to the contract. This, the court was told constituted an attempt to get around state laws.

Forewarned of the court action, the state treasurer already has held up payments totaling $51,535 said to be due the Tuttle organization for work performed, pending an opinion from the state's attorney general.

Named in the suit, in addition to the Tuttle firm, are members of the State Highway Board; G. Bryce Bennett, state highway engineer; Rulon Swenson, state auditor, and Ruth G. Moon, state treasurer.

• **Conflicting views**—Now that the matter is before the court, neither side has made any comment on the matter. But prior to the action, statements gave conflicting views of advice requested and received on legality of the contract.

Raymond J. Briggs of Boise, chairman of the Board of Examiners, said the state attorney general had proclaimed that the contract was illegal.

But Mr. Bennett said the attorney general's office had told him that the contract was legal and could be signed.

Graydon Smith, the attorney general, added that the Tuttle contract price was about $130,000 lower that that suggested by others of the eight firms with which the highway officials had negotiated, and in view of that saving he "regretted seeing the matter wind up in court."

To add to the confusion, Roscoe Rich, chairman of the State Highway Board, said that all the uproar was over what he described as a "legal technicality." He added that the whole contract had been "thoroughly checked out."

And in California, Leo Strecker, principal of the engineering firm, would say only that "we have a valid contract with the State of Idaho Department of Highways, and can foresee no problems in expediting that contract."

• **No bids**—Idaho engineering officials were visibly upset by local newspaper accounts which spoke consistently of the contract to Tuttle as a "bid."

In answer to a query from ENR, Mr. Bennett said that although price was a consideration in the contract award, there was no bidding for it. He explained that, out of a group of about 50 engineering firms that have "evidenced an interest in doing engineering work for the Idaho department, eight were selected for negotiations." All submitted experience records plus a fee—the highest of which, incidentally, was above $1 million.

Other matters considered, in addition to price, were qualifications of the men who would do the work, and readiness to start soon and deliver plans promptly. As it turned out, Mr. Bennett said, these other considerations were favorable enough to the Tuttle proposal to indicate an award.

The highway engineer added that the State Highway Commission "feels that price is a consideration in spending public money, and where a firm which meets other qualifications submits a low propsal, is should be awarded the work."

As an added angle on the matter, it was learned that the Idaho Society of Professional Engineers is studying the practices of public agencies in retaining engineers, and will air a report on its findings at its annual meeting in Pocatello in January.

• **Engineering firm**—Meanwhile, a check in California indicated that the Tuttle firm has ceased to exist under the name in which the contract was signed, as a result of a merger this week with another organization to form Tuttle Engineering, Inc., architects and engineers.

The original Karl F. Tuttle Engineering Co. was founded in 1907, and has had extensive experience in housing projects, Navy road and utility projects, road and airfield work for the Corps of Engineers in Alaska, and other military work. The Idaho contract was its first large-scale civilian highway job.

Principal of the firm was Mr. Strecker, who was president. Mr. Strecker—a past president of the Civil Engineers and Surveyors Association of California; a licensed land surveyor and landscape architect, and an officer in other associations—was also chairman of the board of another architectural and engineering firm, known as Tuttle-Kellogg. The new Tuttle Engineering, Inc., was formed by merger of the original firm and Tuttle-Kellogg.

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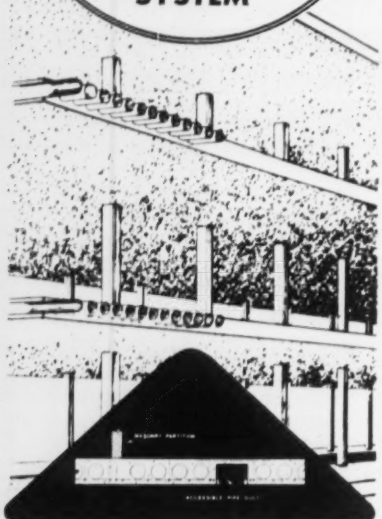

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Land Speculation Charges Force Arizona Road Change

Charges of land speculation, which involved a former member of the State Highway Commission, have resulted in abandoning a realignment plan for U. S. Highway 60, northeast of Globe, Ariz.

Comment on the proposed route arose after J. R. Heron resigned from the State Highway Commission, and it was found that he and business associates held land parcels along the new highway routing. Mr. Heron is president of a savings and loan company which has offices throughout the state, and four interlocking companies he also heads were reported to have bought up land along the new highway.

As an outgrowth of this action, the Highway Department canceled the contract of a road study group that also was affiliated with an Arizona land development firm. The study group was Planning Corporation of America, which also was acting as a consultant for an investment company in Phoenix.

Meanwhile, Arizona legislators indicated that they would move to tighten up on the sometimes freewheeling Highway Department. Two measures have been prepared to regulate land acquisition and sales by the state agency. A third measure would set up penalties for public officials who use their office for private gain.

One of the land acquisition bills would require the Attorney General's office to check proposed highway land purchases before they are made, and to carry out a land appraisal and a title search to determine who owned the property and when it was purchased. The other bill would provide for the setting up of a review board that would consist of three non highway agency members, who would approve Highway Department property sales before they could be made.

McSpedon Dies; Headed N. Y. Building Trades

Howard McSpedon, 55, for many years a key figure in New York City's longstanding labor peace in the building trades, died last week after a brief illness.

A member of the International Brotherhood of Electrical Workers and a journeyman electrician himself, Mr. McSpedon came up through union ranks to be elected president of the city's Building and Construction Trades Council in 1943—a post he held at his death.

Long a leader in community affairs and an advocate of settling labor's differences with management by open discussion, he held many other important posts. These included the presidency of the newly-organized New York State Building and Construction Trades Council; chairman of the finance committee of the New York Building Congress membership in the Greater New York Safety Council and many other civic and religious groups.

Briefs

• **Time for a change**—The new city planner for Huntsville, Ala.—Dean Matthews—has recommended a complete revamping of the city's traffic arteries from grid to wagon wheel pattern, with downtown Huntsville serving as the hub. Heavily increased traffic created by expanding Redstone Arsenal and a new state dock have created an urgent need for street construction and alterations. Cost estimates have not yet been made, but the job is expected to be a major one.

• **Soils testing meeting**—The American Society for Testing Materials, Committee D-18 on Soils for Engineering Purposes and the Sociedad Mexicana de Mecanica de Suelos will hold a joint meeting in Mexico City Dec. 9-13, 1957. Papers from both Mexican and U. S. engineers will be presented.

• **Shopping-center conveyor system**—A $600,000 conveyor system will be installed in a $2.7 million shopping center at Phoenix. The conveyor system will be installed to enable customers to leave purchases at the market checkout stand and pick them up later at a station on the fringe of the 23 acre site. The center, consisting of 29 shops under one roof and connected by arcades, will be completely air conditioned.

• **Drafting standards**—The American Society of Mechanical Engineers has prepared for distribution Section 10—Metal Stamping, of the proposed American Drafting Standards Manual. If you are interested in obtaining a copy for comment or criticism, write to Frank Philippbar, Standards Department, American Society of Mechanical Engineers, 29 W. 39 St., New York 18.

• **Missile plant**—Huntsville, Ala., is being considered as the site of a $300 million plant to manufacture 1,500 mile intermediate-range Jupiter missiles. According to an unconfirmed report the plant may be constructed by Chrysler Corp., prime contractor at nearby Redstone Arsenal. Matkin Mountain, part of Redstone Arsenal, where the Jupiter was designed and built, is one of the more prominent sites mentioned for the plant location.

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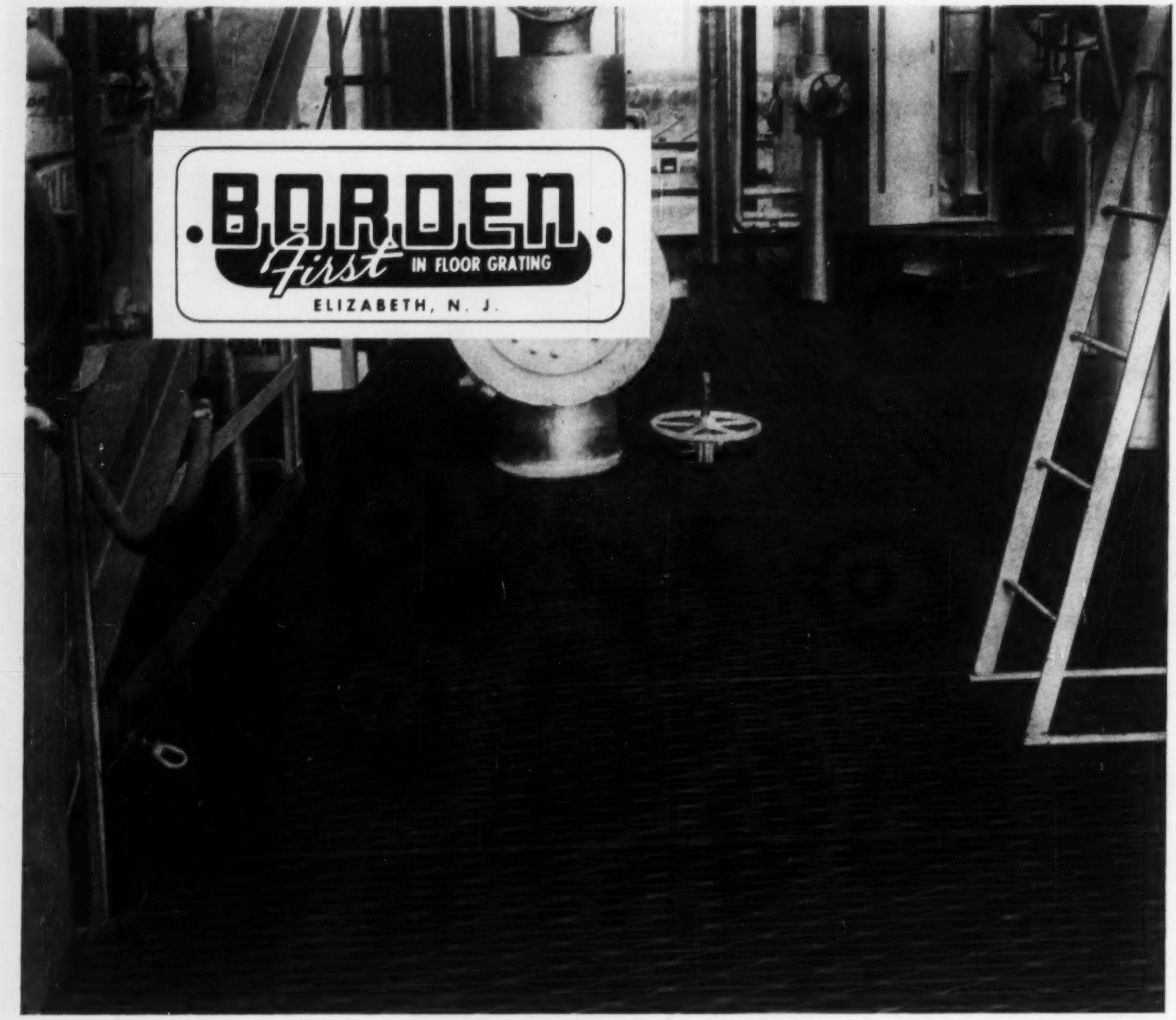

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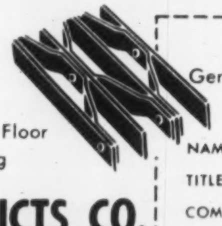

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ENR'S 1956-57 ANNUAL REPORT ON . . .

Construction Costs

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THOUGHTFUL CONSTRUCTION MEN will find a great deal of food for further thought in this issue of Engineering News-Record which records the relentless rise in costs of engineering services, of labor, of materials, of money and of the combination of all of these, the cost of the end product—construction itself.

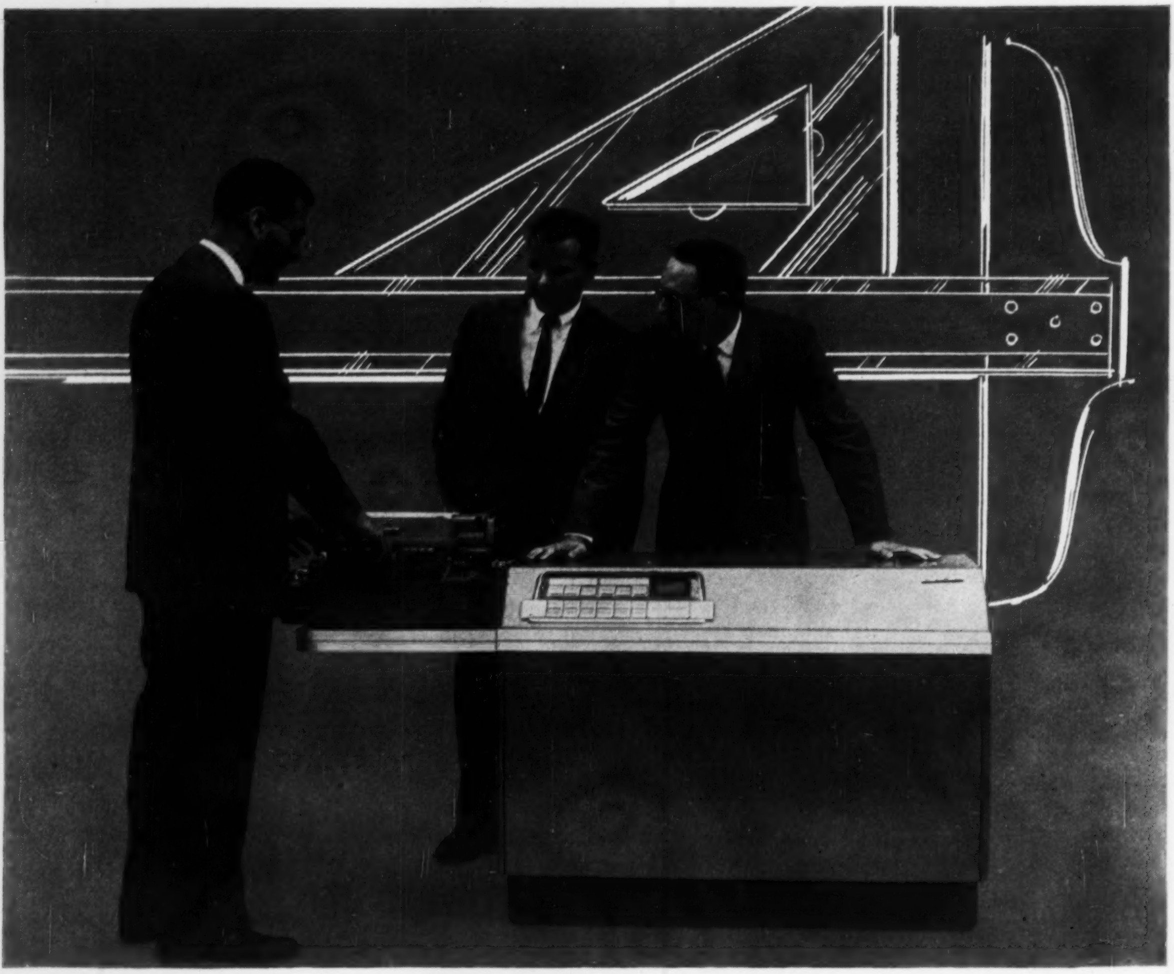
Rising costs can have opposite effects on the good health of the construction industry. Up to a point, just short of a "buyers strike" the uptrend in costs speeds up the process of putting projects under contract to beat the price rise.

But the danger exists of pricing construction out of the market. Once that happens, and "if" buyers hold out to force costs down, the wait for lower costs exaggerates the slow-down in putting projects under contract.

Until last year and this, the higher construction costs were offset in considerable measure by low financing costs. This is no longer the case.

The "economic feasibility" gained through faster depreciation, the "certificates of necessity" for rapid five-year write-offs, helped too to keep construction's customers in the market. But these are now greatly curtailed and are destined to end in 1959.

The next year will be more competitive all along the line. It will be a year for tightening up on management and for planning carefully, a year to start to recapture construction's productivity.



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The '58 Outlook for Construction Costs

While construction costs are headed for a new high in 1958, the slow-down in the rate of increase, already apparent, will continue to dampen the momentum of the cost rise. This was a year when contractor's prices went up as fast or faster than their basic costs. This closed some of the gap between their four-way cost rise for materials, men, machines and money and the earlier slower rise in their prices for completed construction. This rise in contractors' prices, too, should slow down.

The big prime mover back of this cost-price push, the guarantee of the uptrend, is the long-term labor contract with the built-in wage increases. The trend toward these agreements, a few running as long as five years, gained momentum this year. Most provide for annual predetermined increases, some for more frequent wage hikes during the life of the contract. Moreover these scheduled wage increases are substantial. For example, current contracts with common labor unions in 13 of the 20 ENR pricing cities call for hikes in 1958, including fringe benefits, that range from five cents to 22.5 cents per hour (St. Louis). These average more than 12 cents per hour. Similarly, bricklayers, structural ironworkers and carpenters will average 15 cents per hour in wages and benefits scheduled for 1958.

This continuing uptrend in wages affects the materials producers, too, and is reflected in their prices. The highly fabricated materials are even more vulnerable than the basic materials such as steel and cement. For example, structural steel prices have increased 5.5% in the past 12 months, cement prices 4.6%, but construction machinery is up 8% and concrete sewer pipe is up 6.6%.

But a much smaller price rise in 1958 is a good bet for both. The steel supply delivery picture is brighter for contractors in 1958. The stretched-out delivery situation, at its worst in 1956, is over. Cement, too, now has a big margin of capacity above the 1957 shipments rate which will continue into 1958.

Lumber prices continue down from a year ago. The mild upturn in housing starts is too modest to firm up demand enough to bring early price increases.

• **1958 cost forecast**—To measure the overall effect of these movements in materials prices and labor rates the ENGINEERING NEWS-RECORD cost indexes should move in 1958 about like this:

• Construction Cost Index, for 20 cities, will go up 3.5% between now and December '58 to a new high of 763, based on 1913 = 100. This compares with a 4.7% rise in the same period this year.

• Building Cost Index, for 20 cities, will rise 2.5% to a high of 530 by December next year, compared with rises of 3.4% and 4.5% in like preceding periods.

Back of these forecasts are these predictions of how the basic prices and wages will move:

• Structural steel—to rise $0.15 per cwt to $5.425 (average base price at the mills).

• Portland cement—to go up $0.05 per bbl to $3.97 (20-cities average, in bulk, fob).

• Lumber—to dip $1 per Mfbm to an average of $104.50 for Douglas fir and southern pine 2x4's (20-cities average).

• Common labor rates—to increase $0.11 per hour to $2.45, including fringe benefits (20-cities average, building and heavy)

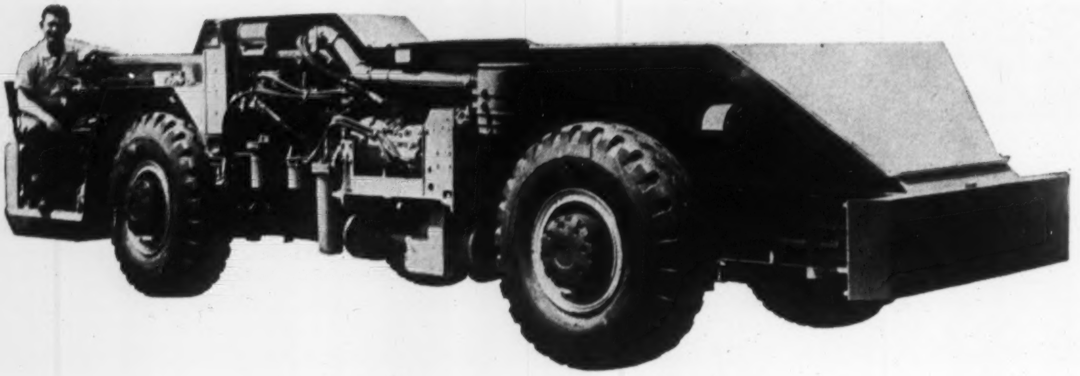
• Skilled labor rates—to increase $0.14 to $3.75 per hour, including fringes (20-cities average for bricklayers, carpenters and structural ironworkers).

• **Machinery prices** moved up sharply in the second half of '57. This was the third consecutive year in which the last six months brought substantial and widespread price increase. Significantly, each of these waves of price advances followed a rise in steel prices, although increased labor costs are also blamed. The latest Bureau of Labor Statistics primary market price index for construction machinery is nearly 8% higher than it was a year ago.

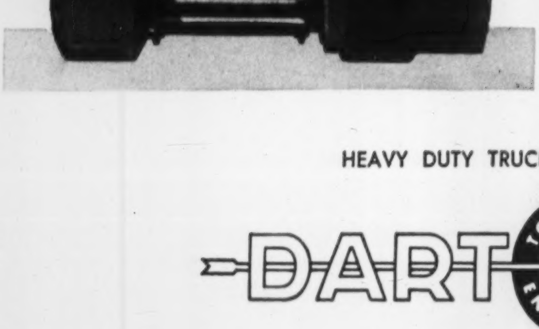
But next year may see more stable machinery price tags. New orders have been disappointing to many makers this year and a couple have voiced fears that they were pricing themselves out of the market.

• **Money,** its cost and its availability affect not only the contractor's need for working capital but also the owner's cost in financing new construction. Interests costs in 1957 on both short- and long-term borrowing hit their highest points since the early thirties. The rise in bank rates on business loans is slowing down and levelling off, but hopeful predictions that the costs are topping out on long-term borrowing are not as yet supported by the curves that measure high-grade bond yields.

DART'S NEW Underground SHUTTLE TRUCK



13 TON CAPACITY . . .
COMPLETE DIESEL—MECHANICALLY DRIVEN



Another member has been added to the family of Dart Underground Shuttle Trucks which have proven highly successful in a number of underground applications. This Dart Model 13S-UG is powered by a Hercules DRX-501 136 HP Diesel engine with a Dart designed exhaust scrubber (optional—Cummins JN-6 125 HP Diesel engine) and Allison Torqmatic transmission. Timken Drive steering axles provide four-wheel drive and four-wheel steering. Hydraulic steering by front wheels alone or combined steering of front and rear wheels enable the truck to "crab" and maneuver in close quarters. Driver's compartment provided with dual shuttle controls.

A flight type conveyor extends the entire length of the body. It is hydraulically driven. Truck length 24'. GVW with 26,000 payload, 51,000 lbs.

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ENR Cost Indexes—Their Composition, History and Use

ENR's Construction Cost Index was established in 1921 to trace the rapid changes in prices, which roller-coasted up and down following World War I. This index was carried back to 1913 by months and to 1903 by years.

The Building Cost Index was established in 1938 when common labor rates began to move up faster than skilled rates.

Both indexes re-price hypothetical blocks of construction made up of the three big materials, steel, lumber, cement and the four big construction trades, common labor, carpenters, bricklayers and ironworkers.

These indexes are used widely to update cost estimates, to establish new values for reproduction of structures, to interpolate special purpose but less frequent and timely indexes, to serve as the base for constructing a special purpose index, to deflate construction dollar volume statistics and measure volume in "constant" dollars.

The ENR Construction Cost and Building Cost Indexes measure trends in basic costs of construction materials and labor without any correction up or down for low or high productivity of management and labor on the construction job. In times when this productivity is low, as in postwar periods, selling prices of construction (as represented by contractors bids or final costs of structures in place) will be relatively higher than the index.

At the other extreme, during a depression, when productivity is high and bidding competition painfully sharp, the selling price of finished construction will be below the material and labor cost trends measured by these indexes.

In between, when productivity changes are less extreme, these indexes have established a long history of accuracy in predicting degree as well as direction of change.

Cost Index Weighting

Components	Construction	Building
Steel ....cwt	25	25
Lumber 2x4's..Mbf	1.088	1.088
Cement ....bbl	6	6
Common labor..hr	200	...
Skilled labor....hr	...	68.38

- Steel is priced at three mills—Pittsburgh, Gary and Birmingham.

- Cement is priced in bulk, fob city, cash discount not deducted, 20 cities.

- Lumber is 2x4's, carlots, fob city except fob mill in Atlanta, Birmingham, New Orleans, Seattle; delivered in Dallas, Detroit, Pittsburgh, St. Louis; lcl at yard in Los Angeles; lcl delivered in Minneapolis; and delivered in trucklots in New York.

- Common labor is priced by a straight average of rates on building and on heavy construction.

- Skilled labor is priced by a straight average of carpenter, bricklayer and structural ironworker rates.

Values for both indexes in each of the 20 U.S. cities for which ENR reports prices and one city in Canada are available from September 1948 to date, quarterly until 1951 then monthly. A second Canadian city, Toronto, was added in April, 1955.

Both indexes are now computed weekly for 22 cities and the U.S. and published in CONSTRUCTION DAILY. The weekly index dated Thursday closest to the first of the month is the official monthly index.

Few Changes Needed

In the 36 years since the ENR Construction Cost Index was established, four minor modifications have been made to meet changing materials and labor markets as follows:

Steel: In 1938, Pittsburgh "plus" pricing of steel was ruled out. An average of base prices at Pittsburgh, Gary and Birmingham mills was substituted for the old Pittsburgh mill price series, effective with the August, 1938, ENR Construction Cost Index. No change in steel's weighting was necessary.

Cement: In mid-1948 cement went off basing point pricing with considerable readjusting in cement prices in areas distant from mills. ENR substituted a 20 cities average of bulk cement prices which was so close to the old fob Chicago price that the weighting was unchanged.

Lumber: In 1936, the price of 12 in. long leaf yellow pine timbers was replaced by a 20 cities price average of 2x4 Douglas fir and southern or local pine, S4S, carload lots. A new weighting of 1.088 Mfbm was adopted on the basis of the 1936 difference in price level of the old and new lumber price series, so the 1936 Construction Cost Index value average would not be changed. The previous weighting was 0.6 Mfbm 12x12 LLYP at New York City.

Labor: During the "pump priming" days of the Thirties common labor wages climbed faster than did skilled wages. To measure the effect of this divergence between common and skilled wages, the ENR Building Cost Index was established in 1938. Its labor component is based on the ENR 20 cities series for skilled labor wages—an average for carpenters, bricklayers and iron workers.

To get the weighting for labor in the Building Cost Index, the ENR skilled wage average for 1913 was divided into the labor component of the 1913 ENR Construction Cost Index. This gave 68.38 hours for a Building Cost Index base of 100 for 1913.

How to Convert Indexes To Other Base Years

To change base years for Engineering News-Record Construction and Building Cost Indexes, divide by following conversion factors:

To convert from base 1913 = 100 to base below...		Divide 1913 = 100 values fo Construction Cost Index by	Building Cost Index by
1949 = 100	d	4.7702	3.5179
1947-49 = 100		4.5033	3.3642
1940 = 100	c	2.4196	2.0281
1939 = 100	b	2.3551	1.9744
1926 = 100	a	2.0803	1.8499
1925-29 = 100		2.0695	1.8648
1926-29 = 100		2.0702	1.8747
1929 = 100		0.0702	1.9086
1910-14 = 100		0.9380	0.9477
1924 = 100		2.1536	1.8578
1923-25 = 100		2.1204	1.8481
1914 = 100		0.8856	0.9191
1911 = 100		0.9343	0.9414

Applies to 20-cities index, not to individual cities

a,b,c,d, conversion factors—used to get the accompanying table showing ENR cost index values for four different base years, 1926, 1939, 1940, 1949.

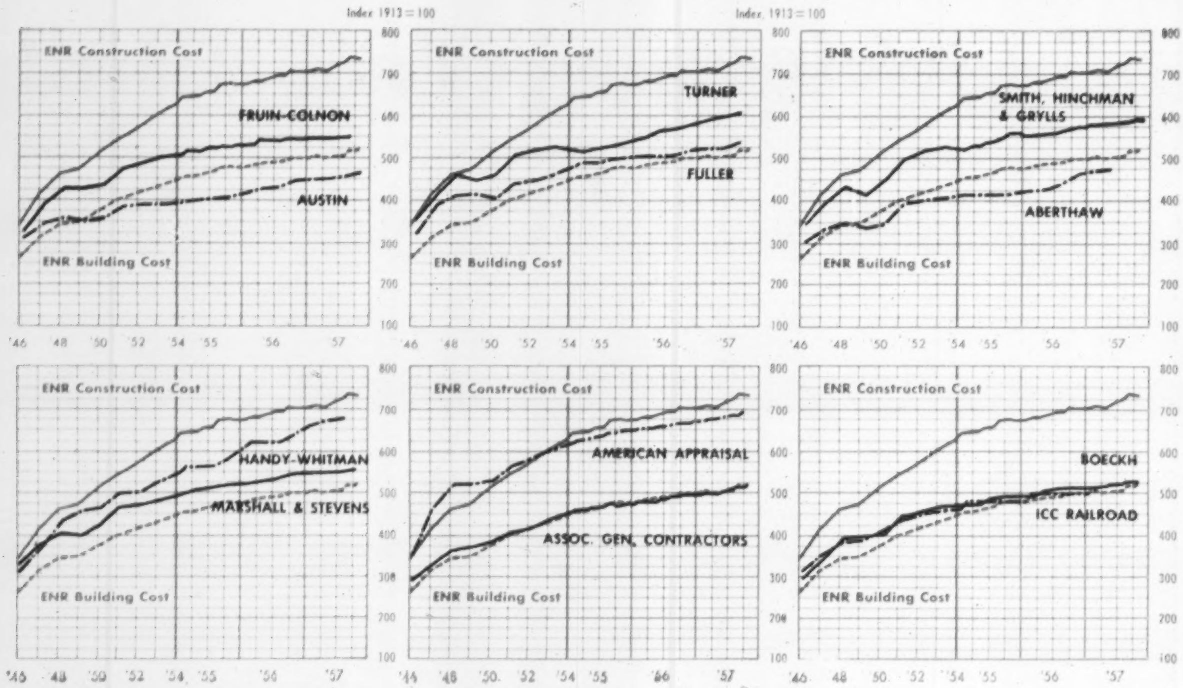
Conversions to other base years are made by simple ratios:

$$I_{nb} = \frac{I_{ob}}{I_{nby}} \times 100$$ where I_{nb} is index on new base, I_{ob} is index value on old base, I_{nby} is old base index value for new base year

ENR Cost Indexes For Other Base Years

Engineering News-Record Cost Indexes may be converted to any base year desired:

Index Value	Construction Cost Base Years				Building Cost Base Years			
Year	'26 = 100	'39 = 100	'40 = 100	'49 = 100	'26 = 100	'39 = 100	'40 = 100	'49 = 100
1926	100	88	86	44	100	94	91	53
1928	99	...	...	...	102	...	...	...
1929	100	...	...	...	103	...	...	...
1930	98	...	...	...	100	...	...	...
1931	87	...	...	...	91	...	...	...
1932	75	...	...	...	76	...	...	...
1933	83	...	...	...	80	...	...	...
1939	113	100	...	...	107	100	...	...
1940	116	103	100	...	110	103	100	...
1941	124	109	107	...	114	107	104	...
1942	133	117	114	...	120	113	110	...
1945	148	131	127	...	129	121	118	...
1946	166	147	143	...	142	133	129	...
1947	199	175	171	...	169	159	154	...
1948	222	196	190	...	186	175	170	...
1949	229	203	197	100	190	178	173	100
1950	245	216	211	107	202	190	185	107
1951	261	230	224	114	217	203	198	114
1952	274	242	235	119	225	211	205	118
1953	288	255	248	126	233	218	212	122
1954	302	267	260	132	241	226	220	127
1955	317	280	273	138	254	237	231	133
1956	333	294	286	145	265	249	242	140



Building Cost and Price Indexes

Whether measured by weighted cost or contractor price indexes, new construction costs continued to move into higher ground in 1957. But in most cases, cost and price indexes rose at a slower rate than in 1956. Though wage costs were uniformly higher, lower housing and industrial building contracts eased buying pressure on lumber, aluminum, copper, plumbing, and other materials. Declines in many material prices partly offset increased labor, steel, and freight costs.

Of the five contractor price indexes reported to ENR, three increased more slowly in '57. But the Aberthaw and Fuller indexes rose faster this year than last. And of the weighted cost indexes, only the Smith, Hinchman & Grylls index increased faster in '57 than in '56.

ENR's Building Cost Index rose 4.2% between October '55 and '56 but only 3.4% between October '56 and '57. Bigger 1957 increases in common labor rates pushed ENR's Construction Cost Index up more sharply in '57—or 4.7% against 4.5% in '56.

Descriptions of the key cost and price construction indexes follow.

What These Indexes Cover

A variety of special purpose indexes is represented here; the contractor selling price indexes, appraisal indexes, accounting indexes. What each covers is defined in the following paragraphs and pages. The original bases are shown in the roundup table. These have been converted to 1913 = 100 for the table and charts, except as noted on the table.

- **Aberthaw Co., Boston, Mass.**—Since March 31, 1946, a composite of 36 major cost items in three multi-story and two one-story New England industrial buildings, including all mechanical trades. Re-priced quarterly using actual and estimated labor and material costs. Before March 31, 1946, based on New England seven-story and basement, 62 ft 4 in. x 202 ft 4 in., reinforced concrete building built in 1914. Quarterly.

- **American Appraisal Company, Milwaukee, Wis.**—30 cities average used here. See opposite page for definition and values for 22 cities. Monthly.

- **Associated General Contractors of America (AGC), Washington, D. C.**—Wages and materials for 12 cities combined in 40-60 ratio. Wages are prevailing rates for hod carriers and common labor. Materials are weighted: sand, gravel, and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ½; structural and reinforcing steel, ½. Monthly.

- **Austin Co., Cleveland, Ohio.**—Reprices typical one-story, steel frame, monitor-type industrial building. Includes concrete foundations, brick curtain walls, continuous steel sash, concrete floor laid on ground, 2 in. wood roof deck on timber purlins covered

Building Cost and Price Index Roundup

Yearly averages, 1913 = 100, converted where necessary from original base

WEIGHTED	Orig. Base	1926	1932	1939	1942	1945	1946	1948	1949	1952	1953	1954	1955	1956	1957
ENR Construction	1913 = 100	208	157	236	276	308	346	461	477	569	600	628	660	692	737 O
ENR Building	1913 = 100	185	141	197	222	239	262	345	352	416	431	446	469	491	517 O
American Appraisal*	1913 = 100	217	155	200	241	271	322	490	490	553	577	592	608	635	668 A
Assoc. Gen. Contr	1913 = 100	197	171	188	209	231	257	332	342	388	408	426	439	462	490 S
Boeckh, U. S. Comm. & Fac.**	1926-29 = 100	181	144	191	214	252	275	365	369	430	445	450	465	489	513 S
Marshall & Stevens	1926 = 100	185	130	183	218	248	288	368	365	436	448	459	479	503	522 S
Smith, Hinchman & Grylls**	1926 = 100	185	128	199	226	285	319	405	395	499	504	500	522	544	572 S
ICCRR Sta & Off Bldgs	1910-14 = 100†	184	141	166	208	244	291	364	368	426	438	442	460	480	
WR & A—RC Bldg Pac Div	1911-14 = 100†	191	153	192	240	248	273	393	416	467	489	510	527	588	641 Jl

* Adjusted for estimated productivity. ** Includes overhead, profit; adjusted for estimated productivity.

CONTRACTOR	Orig. Base	1926	1932	1939	1942	1945	1946	1948	1949	1952	1953	1954	1955	1956	1957
Aberthaw	1914 = 100†	197	168	190	223	236	279	321	312	381	388	394	398	427	455 Ap
Austin	1926 = 100	185	117	152	213	234	273	317	307	342	347	352	366	400	424 S
Fruin-Colnon	1926 = 100	218	178	208	227	247	285	382	382	449	460	469	483	503	513 Jl
Fuller	1913 = 100	202	157	195	229	241	290	380	382	416	429	450	462	482	509 Jl
Turner	1939 = 100	195	136	182	245	263	318	422	414	490	500	489	498	544	580 Jl

†Not converted to 1913 = 100. • Ap April • J June • Jl July • A Aug • S Sept • O Oct

with four-ply waterproofing, monitor sash with mechanical operators, but no heating, lighting, plumbing, sprinkler, or other services. Priced for central and eastern states. Quarterly.

- **E. H. Boeckh & Associates, Inc., Washington, D. C.**—20 cities average for five commercial and factory buildings price indexes used here. See page 91 for definition and values for 10 classes of buildings in 21 of the 47 U.S. cities covered. Monthly.

- **Fruin-Colnon Contracting Co., St. Louis, Mo.**—Five industrial buildings in St. Louis re-priced monthly on basis of contractor's actual and estimated material and labor costs. Monthly.

- **George A. Fuller Co., New York, N. Y.**—Based on price movements of all materials and labor needed to construct four typical buildings: two in commerce, one in industry, and one purely monumental, modified through the years to include all modern innovations of engineering and architecture, such as high-speed elevators, modern lighting, cantilever constructions, lightweight aggregates, etc. Re-priced quarterly on basis of company's experience.

- **Marshall and Stevens, Inc. of Illinois, Chicago, Ill.**—Building cost index used here. See page 85 for its description and for industrial equipment cost indexes. Quarterly and annual for ENR.

- **Smith Hinchman & Grylls, Inc., Detroit, Mich.**—Actual in-place costs, using building materials costs, freight rates, skilled and unskilled labor rates and including labor efficiency and premiums, bidding competition, contractor profit margins and overhead. Figured with the contractor overhead are taxes, duration of projects, material expediting, and labor procurement. Monthly.

- **Turner Construction Co., New York, N. Y.**—Eastern cities. Own cost experience on labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions, forecast of price trends. Quarterly and special as needed.

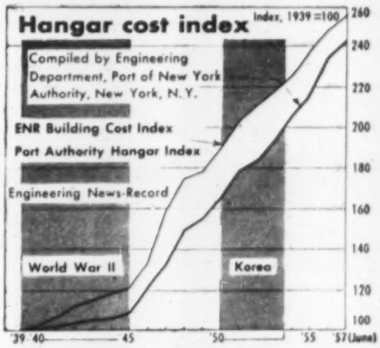
- **Railroad Construction Cost Indexes ICC, Washington, D. C.**—Stations and office building series used here. See page 93 for definition of this Interstate Commerce Commission analysis of major contracts. Annual.

- **Handy-Whitman, Whitman, Requardt & Associates, Inc., Baltimore.**—Reinforced concrete building in the Pacific Division series used here. See page 93 for definition and selected values for seven of 103 construction cost elements. Semi-annual.

- **Dept. of Commerce Composite Cost Index**—Weights special purpose and general construction cost and price indexes by estimated dollar volume of construction put in place.

On some types of work, two indexes are used, one special purpose for deflating, the other for interpolating for months between the less frequent values of special purpose indexes. (See footnote to table.)

- **BLS Price-Earnings Composite**—Combines hourly earnings and wholesale price indexes. (See footnote to table.)



- **The Hangar Cost Index**—Chart above is based on a hangar built in New York City in 1940. It includes 13 elements representing almost 76% of the total structural and mechanical cost. It excludes interior finish, mechanical trades and electrical work. The items used, each re-priced "in place" for a combined labor and materials sub-total, include excavation and fill, concrete piles, concrete foundations (forms, concrete, reinforcing), concrete floors (forms, concrete, reinforcing), metal doors and windows, masonry, structural iron and steel, roofing, sheet metal.

This index, based on a 1940 design, is not adjusted to account for design changes, for longer spans or higher clearances.

American Appraisal Index

This index is based on detailed analysis of materials and labor required for four types of buildings (frame, brick, concrete, and steel) in 30 representative cities. It is re-priced monthly in accordance with prevailing wage scales and labor performance for the various building trades and quotations for construction materials in 30 key cities in the United States. The index corrects for labor productivity but assumes normal average conditions and does not give any recognition to overtime or bonus payments to labor or premiums paid for materials in individual cases or under temporary abnormal conditions. It applies to construction only.

Composite Cost Index

Bldg. Materials & Constr. Div., U. S. Dept. of Commerce, 1947-49=100

By years		By months	1949	1952	1953	1954	1955	1956	1957
'34	48	Yr	103	119	122	122	125	132	...
'35	47								
'36	48	J	106	117	121	121	122	128	134
'37	51	F	105	117	121	121	122	129	135
'38	52	M	105	117	121	121	123	129	135
'39	49	A	104	117	121	120	123	130	135
'40	50	M	103	118	121	121	124	131	136
'41	54	J	103	119	122	121	125	132	137
'42	61								
'43	65	J	102	120	123	122	125	133	138
		A	101	121	123	122	126	134	138
'44	64	S	101	121	123	122	126	134	...
'45	67								
'46	77	O	102	121	122	123	127	134	...
'47	93	N	102	121	122	122	127	134	...
'48	104	D	101	120	122	122	127	134	...

By classes of construction the indexes used are: residential, Boeckh; industrial building, Turner—Boeckh; warehouses, office and loft buildings, Fuller—Boeckh; other private and public buildings, American Appraisal; farm dwellings, Bu of Agriculture Economics—Boeckh; farm service buildings, BAE—Amer. Appr; railroad, ICCRR—ENR Construction; telephone & telegraph, ICCT&T—ENRC; electric and gas utilities, Handy-Whitman—ENRC; petroleum pipeline, HW—ENRC & ICC—ENRC; all other private, aver ENRC & Assoc. General Contractors. Military and Naval, aver of Amer Appr, Bu of Public Roads—ENRC, Fuller—Boeckh, Turner—Boeckh; highway, BuPR—ENRC; sewer & water, aver AGC & ENRC; misc public service, aver HW—ENRC; conservation & development and all other, aver AGC—ENRC.

Price-Earnings Composite Index, Building Construction

Bu. of Labor Statistics, 1947-49=100

By years		By months	1949	1952	1953	1954	1955	1956	1957
'34	44.4	Yr	103.7	121.6	126.2	126.9	133.5	139.6	.....
'35	44.6								
'36	45.1	J	105.4	120.2	123.8	128.1	130.9	137.5	142.0
'37	49.6	F	105.3	120.5	124.2	128.1	131.2	137.9	141.8
'38	48.1	M	105.1	120.8	124.9	128.1	130.9	138.4	141.8
'39	48.7	A	104.5	120.9	125.3	127.5	131.5	138.9	142.2
'40	50.6	M	103.8	120.4	125.5	127.5	131.9	138.8	142.5
'41	54.4	J	103.1	120.0	125.7	127.2	132.2	139.1	142.8
'42	59.6								
'43	62.2	J	102.3	121.0	126.8	128.5	133.6	139.3	.....
		A	102.2	121.8	126.9	129.3	134.8	140.3	.....
'44	64.9	S	102.4	122.7	127.3	130.0	135.7	140.7	.....
'45	66.9								
'46	73.8	O	102.7	123.3	127.5	130.3	136.3	141.1	.....
'47	93.4	N	103.0	123.3	127.4	130.6	136.1	141.1	.....
'48	103.0	D	103.8	123.5	127.9	131.9	136.4	141.4	.....

This Index combines BLS Wholesale or Primary Price Index of Building Materials, weighted 61.4%, and BLS Index of Average Hourly Earnings in Building Construction, weighted 38.6%. Weights are based on BLS studies of 1939 projects. No adjustments are made for competitive conditions, productivity or overhead.

Building Cost Index

American Appraisal Co., Milwaukee, Wis., 1913=100

30-cities average and 22 individual cities.

	'26	'32	'39	'42	'45	'49	'54	'55	'56	Jun '57
U. S. Avg., 30 cities	217	155	200	241	271	490	591	608	635	664
Boston	224	169	210	248	270	485	593	610	644	675
New York	234	170	219	248	272	503	626	634	666	705
Buffalo	219	157	205	247	279	506	619	635	661	714
Baltimore	224	166	198	248	277	510	595	606	638	655
Philadelphia	225	161	196	247	275	481	587	603	625	663
Pittsburgh	236	172	219	249	279	486	582	591	616	652
Cincinnati	217	157	209	242	272	477	571	589	609	652
Cleaviand	233	160	206	245	258	485	592	609	640	679
Chicago	219	162	205	235	260	452	550	569	595	616
Indianapolis	219	157	206	247	276	501	606	622	641	660
Detroit	224	148	208	252	278	500	625	644	665	708
Milwaukee	218	144	209	254	280	493	615	632	676	707
Minneapolis	197	148	202	235	266	453	553	578	620	639
Kansas City	220	156	209	239	268	469	554	567	586	606
St. Louis	230	163	208	238	265	478	580	604	634	656
Atlanta	211	147	186	240	278	514	643	658	685	712
Dallas	204	146	171	209	246	455	533	545	563	587
New Orleans	217	145	194	234	277	501	604	622	637	677
Denver	204	149	195	226	245	441	522	540	565	580
Seattle	199	141	196	244	277	509	592	604	632	645
San Francisco	188	144	183	225	244	446	534	563	593	609
Los Angeles	195	141	167	213	249	475	556	586	621	625

"With Transite ...we excavate, install the pipe and button up the trench fast"

says Mr. Frederick J. Gallagher
F. J. Gallagher Trenching Co.
Tucson, Arizona

Photos by Ray Manley, Tucson

"By using Transite Pressure Pipe, we completed this 70,000-ft. water system contract several weeks faster than we had estimated. Transite's ease of assembly keeps our time and labor costs low. We excavate, install the pipe, and button up the trench fast. This speed is especially advantageous when we encounter cross service lines or are faced with bad weather. And always important, it means less annoyance to our own townspeople and the local merchants."

JOHNS-MANVILLE
JM
PRODUCTS

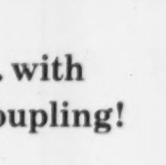
Crews of F. J. Gallagher Trenching Co. installing 14" Transite line in Tucson, Arizona

Transite Pressure Pipe keeps the job moving fast . . . with a good "tight" installation assured by its Ring-Tite Coupling!

Like Mr. Frederick Gallagher, contractors across the nation prefer working with Transite® Pressure Pipe because of its easy handling and simplified assembly. For both advantages help complete an installation fast—keep time and labor costs low!

With Transite, you'll find your crews consistently keep right up with the excavator. Its lightweight, long (13′) lengths and quickly assembled Ring-Tite® Coupling make their job easier, faster. Measuring for and digging of bell holes can be eliminated. There's no need for any but the simplest joining tools. And—all important—within the Ring-Tite Coupling, pipe ends are automatically positioned to allow for expansion.

We'll be pleased to send you booklet TR-160A. Write Johns-Manville, Box 14, N. Y. 16, N. Y.



Sectional view of Ring-Tite Coupling ▶ is cut away to show how rings are compressed and locked in grooves to provide *a tight, lasting seal!*

JOHNS-MANVILLE

Transite Pressure Pipe

ENR Cost Indexes in 22 Cities

The components of the ENR Construction Cost Index and weighting in U.S. cities are: 25 cwt of structural steel shapes, average base price at three mills; 6 bbl of Portland cement, in bulk; 1.088 Mfbm of 2x4 lumber; 200 hr of common labor.

In Canada, the warehouse price has to be used, so 15 cwt is the weighting for structural steel. Price of Canadian-made steel is used prior to October, 1949; the average of Canadian and U.S. steel is used after the devaluation of the Canadian dollar in October '49. The cement weighting is 10 bbl. Lumber and wage rates are weighted the same as in the U.S. indexes. Components of the Building Cost Index and weighting are the same except 68.38 hr of skilled labor is used.

These regional indexes were first reported quarterly from September 1948 through March 1951, then monthly beginning in April 1951. Each of 21 cities indexes together with their components has been reported weekly in the Construction Daily starting July 1954. The Toronto indexes were added in April 1955 to make a total of 22 cities reported each week.

CONSTRUCTION COST INDEXES 1913=100

	1948		1949				1950				1951				1952				1953				1954				1955			
	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Atlanta	325	345	345	345	345	345	354	354	394	390	395	395	395	395	395	397	402	418	424	438	460	460	458	458	474	474	474	472	492	495
Baltimore	462	462	462	425	424	424	427	462	479	474	486	488	482	513	510	511	530	526	524	525	551	553	549	548	573	578	574	575	595	592
Birmingham	378	379	379	389	389	377	381	381	388	413	416	416	416	416	417	417	450	450	450	447	469	465	465	465	488	507	511	511	519	534
Boston	513	508	507	526	525	532	536	556	570	563	576	586	590	588	590	614	630	629	626	623	626	624	627	659	669	671	675	696	709	709
Chicago	537	530	527	526	541	542	550	584	607	593	603	598	620	624	626	626	661	661	661	690	691	690	692	693	734	734	736	741	752	762
Cincinnati	505	505	490	487	496	496	502	510	568	553	559	556	543	548	547	553	612	609	609	613	633	631	630	630	641	642	645	664	673	671
Cleveland	535	523	520	514	525	530	537	578	605	587	607	606	603	626	625	685	684	682	682	706	709	708	712	731	738	751	759	762	785	785
Dallas	398	398	398	398	394	397	422	423	423	438	437	437	437	437	437	437	455	455	455	463	470	482	470	465	487	484	484	488	507	510
Denver	499	496	482	482	470	470	491	506	541	528	552	558	564	564	571	572	577	612	602	582	604	595	595	597	633	632	635	637	656	653
Detroit	511	500	501	489	514	515	521	555	583	592	592	602	601	601	621	625	636	663	663	663	687	682	685	700	729	729	743	763	776	772
Kansas City	500	500	484	501	511	511	528	551	571	570	570	575	586	586	586	588	623	623	623	623	630	630	635	645	661	663	664	685	702	702
Los Angeles	511	495	482	478	489	494	511	529	552	537	580	572	558	569	565	574	610	610	610	612	627	626	634	640	665	667	667	672	705	708
Minneapolis	512	510	504	504	512	512	516	538	555	562	557	587	587	592	593	593	628	628	628	655	661	661	661	681	697	697	697	711	720	720
New Orleans	350	354	379	379	379	379	383	402	408	438	441	439	434	435	435	437	466	466	476	486	506	502	506	516	528	523	522	535	545	545
New York	549	541	537	534	533	539	546	575	632	622	630	627	621	626	623	629	667	665	665	664	713	713	732	732	742	745	747	750	794	791
Philadelphia	470	467	462	492	517	515	518	541	556	575	575	575	582	582	601	616	636	636	636	635	666	666	666	681	691	691	696	711	721	721
Pittsburgh	470	502	502	492	492	492	497	499	532	529	531	531	551	557	557	557	607	607	607	608	640	640	645	645	666	654	657	669	690	695
St. Louis	542	542	527	508	524	522	529	552	579	569	585	597	584	587	587	608	629	628	627	648	653	654	655	669	684	687	693	720	728	727
San Francisco	490	484	478	478	483	483	486	495	513	519	518	533	525	527	532	565	573	559	557	556	587	600	602	617	631	649	658	676	690	684
Seattle	512	512	530	530	530	530	534	548	564	563	586	586	593	592	606	620	635	635	635	636	636	643	664	665	682	676	676	681	693	685
Montreal	406	408	407	408	396	394	397	397	428	427	445	473	484	484	500	510	512	512	516	516	550	550.	516	513	526	542	528	525	532	550
Toronto	...																										...	543	538	554

BUILDING COST INDEXES 1913=100

	1948		1949				1950				1951				1952				1953				1954				1955			
	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Atlanta	302	308	308	308	309	313	316	316	339	339	339	339	339	351	351	353	364	371	376	376	394	394	392	392	400	400	400	399	417	419
Baltimore	375	387	387	349	354	351	354	375	391	387	398	403	398	413	410	414	420	416	414	415	427	428	424	423	448	455	450	452	472	472
Birmingham	320	321	326	329	330	319	321	321	328	345	351	351	351	353	355	358	372	372	372	372	390	386	386	386	409	420	423	423	434	442
Boston	363	357	357	362	361	372	375	379	396	392	404	407	412	410	411	422	426	425	422	419	433	433	436	438	448	453	458	471	488	487
Chicago	360	353	350	349	352	353	361	381	404	391	401	395	408	413	415	416	432	433	433	443	443	443	445	449	467	468	469	477	488	486
Cincinnati	374	374	358	356	362	362	360	368	406	392	400	398	395	401	400	406	423	420	420	424	435	434	435	434	444	445	450	456	467	466
Cleveland	352	339	337	332	342	349	356	379	406	388	402	402	399	403	403	419	431	428	430	435	439	438	442	451	458	464	472	477	489	489
Dallas	322	322	322	322	316	318	322	323	323	338	362	362	371	371	371	371	382	382	382	387	397	405	393	390	405	402	402	406	422	426
Denver	369	365	351	351	359	359	378	395	423	400	426	432	423	425	431	433	452	462	452	434	449	441	441	443	468	467	470	474	485	483
Detroit	358	347	348	336	351	351	357	376	404	400	402	411	410	416	419	424	439	438	438	441	450	446	449	452	467	466	481	490	503	498
Kansas City	366	367	352	357	357	357	374	390	410	406	406	411	417	417	431	434	446	446	446	452	442	442	446	450	466	466	467	477	495	494
Los Angeles	368	356	343	339	336	340	360	380	392	377	403	395	381	398	394	407	415	415	420	421	420	419	428	433	448	452	453	457	483	479
Minneapolis	370	368	361	361	361	363	377	389	406	413	408	421	423	438	438	438	450	454	454	459	468	468	468	473	491	492	492	493	502	502
New Orleans	302	310	325	325	325	325	329	340	346	376	379	377	379	379	379	381	397	397	398	407	419	416	119	422	435	432	431	439	449	449
New York	403	395	400	398	397	402	410	439	464	459	466	463	457	462	460	465	487	484	484	483	505	507	509	516	526	528	531	533	548	545
Philadelphia	394	391	386	394	394	392	397	415	430	449	449	449	456	461	462	472	477	480	480	479	494	494	494	503	516	516	521	523	533	535
Pittsburgh	376	384	384	375	375	377	382	387	401	397	400	400	405	416	416	416	427	439	439	440	460	460	463	463	475	475	478	489	498	506
St. Louis	385	391	386	375	379	377	384	396	431	421	432	436	422	427	429	444	448	447	446	446	457	455	455	457	473	477	483	495	503	502
San Francisco	350	347	341	341	341	345	352	361	383	389	375	380	377	379	383	386	403	389	390	389	396	397	399	404	420	441	447	447	468	461
Seattle	328	328	328	328	340	341	344	358	374	374	384	384	389	383	389	389	400	400	400	401	402	402	412	413	419	414	414	418	436	428
Montreal	314	316	315	316	316	314	317	317	346	345	363	378	385	385	383	393	395	395	399	399	430	430	396	393	391	422	408	405	412	427
Toronto	...	...																									...	449	436	432

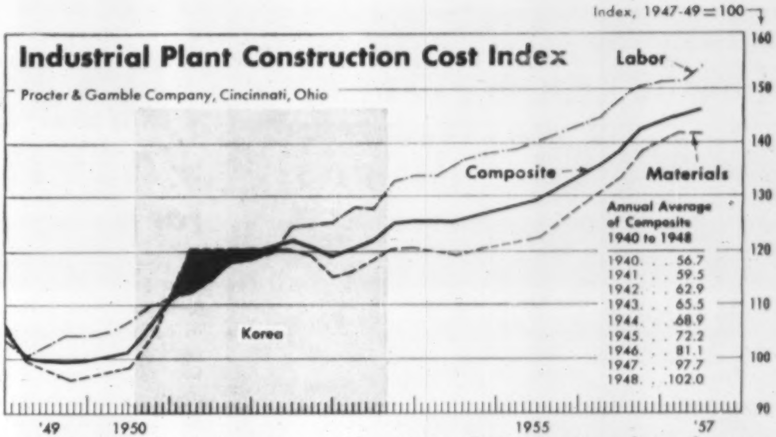
Industrial Building & Equipment Costs

Three separate cost indexes are computed quarterly by the Proctor & Gamble Company. These indexes are used by them for "time indexing" their industrial plant cost data. These indexes include a labor cost, materials cost and a composite cost index which is a weighted average—64% materials and 36% labor (see chart at top of facing page).

- **Labor Cost**—From past experience, the company determined the average relative weighting by crafts of the construction crews it normally utilizes. It then computes a weighted average of ENR-reported wage rates, including fringe benefits, for 10 cities in which the company has factories. This average is then converted to an index based on labor costs in 1947-49 as 100.

- **Material Cost**—Over 400 material items are covered by four major classifications of construction materials which make up this index: building materials; equipment; process piping; and power wiring (electrical) items. Individual items included in these four classifications are obtained from the U.S. Bureau of Labor Statistics Wholesale (Primary Market) Price Index data.. These

ENR Cost Indexes measure movements in the cost to contractors and engineers of construction materials and labor. They do not adjust for changes in productivity. Where major differences between cities occur, the main reason is found usually in wage differentials. Lower wages are often accompanied by lower productivity, hence allowances for job productivity should be made in estimating end-product price, or construction selling price trends based on the cost trends shown here.



	1956				1957		
	Mar	Jun	Sep	Dec	Mar	Jun	Sep
Atlanta	502	502	522	522	523	523	550
Baltimore	591	595	601	602	642	643	670
Birmingham	546	549	557	553	556	556	563
Boston	712	744	746	747	744	746	773
Chicago	769	788	792	790	789	831	838
Cincinnati	674	680	717	715	711	713	751
Cleveland	785	809	826	819	820	856	861
Dallas	512	509	534	534	525	525	547
Denver	655	670	680	696	697	702	710
Detroit	778	800	810	808	809	823	832
Kansas City	705	709	720	715	715	735	742
Los Angeles	714	733	736	731	731	731	778
Minneapolis	721	747	757	757	758	781	788
New Orleans	547	564	567	564	563	572	581
New York	816	819	847	842	852	852	890
Philadelphia	722	737	747	747	749	780	776
Pittsburgh	688	688	727	727	762	762	791
St Louis	757	756	761	759	760	789	796
San Francisco	693	726	727	722	720	758	763
Seattle	715	720	724	722	746	749	756
Montreal	552	560	560	561	560	586	587
Toronto	558	562	592	595	596	611	608

	1956				1957		
	Mar	Jun	Sep	Dec	Mar	Jun	Sep
Atlanta	424	424	441	441	442	442	458
Baltimore	472	491	497	498	499	503	518
Birmingham	443	447	456	455	457	457	468
Boston	490	503	508	509	507	518	531
Chicago	493	501	507	506	504	511	530
Cincinnati	469	475	493	491	486	489	507
Cleveland	489	508	515	508	509	522	527
Dallas	428	424	446	449	439	439	451
Denver	487	488	503	519	523	510	522
Detroit	505	514	528	527	528	535	545
Kansas City	497	496	507	503	505	503	516
Los Angeles	485	491	497	494	494	496	508
Minneapolis	503	515	526	526	527	530	537
New Orleans	451	457	462	464	463	467	477
New York	553	556	573	569	578	578	590
Philadelphia	536	538	548	549	556	560	562
Pittsburgh	500	500	529	533	541	541	566
St. Louis	523	522	527	525	529	538	546
San Francisco	470	478	480	484	485	504	497
Seattle	439	444	452	450	452	456	467
Montreal	429	437	437	438	437	451	452
Toronto	446	450	465	459	462	469	468

four classification indexes are then weighted and combined into the overall materials cost index.

- **Composite Index**—The composite index is calculated by combining the labor and material cost indexes in a 64/36 ratio. Although the company uses this composite in certain cases, it prefers to index labor and materials costs separately. This is because it finds the two indexes move "quite independently of one another, and our labor/material ratios fluctuate over a wide range."

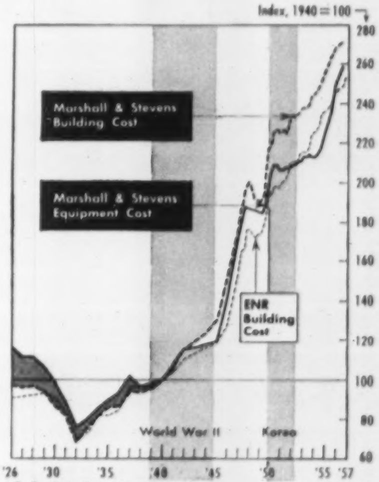
This mathematical approach is modified during periods of unusual conditions affecting costs such as the company experienced in the post World War II period and during the Korean conflict.

Marshall & Stevens Index

Marshall & Stevens indexes cover both comparative building costs, 1902 to date, and comparative equipment costs, 1913 to date.

The building indexes are national averages with a system of modifiers to get regional and municipal values for each of four types of building: A—Fireproof, protected steel; B—Fireproof, reinforced concrete; C—Masonry buildings; D—Frame. They are designed to reflect normal costs in line with recognized or published prices of building materials, equipment, and labor. Extraordinary or intangible conditions are not included.

Comparative equipment costs, developed to cover the composite of the entire plant, machinery of various kinds, mechanical installation, furniture and fixtures, hand tools and other items are combined in proper proportion to their average occurrence in each plant and computed for 47 industries. Eleven series are reproduced here, five of which are averages of three or more M&S related series.



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Industrial Equipment Cost Indexes

Marshall & Stevens, Inc. of Chicago, Illinois, 1926 = 100

Industry	1929	1932	1939	1945	1946	1947	1948	1949	1950	1954	1955	1956	Sept 1957
Average of All	**91.9**	**66.1**	**84.8**	**103.4**	**123.2**	**150.6**	**162.5**	**161.2**	**167.9**	**184.6**	**190.6**	**208.8**	**225.0**
Commercial (av. 12*)	91.8	67.6	86.8	105.2	120.9	146.9	158.6	152.7	150.8	183.3	179.8	195.9	206.9
Transportation—garage	91.5	69.2	83.6	100.9	123.9	157.0	171.1	170.3	179.7	199.0	205.5	227.6	249.3
Public util (av. 2*)	91.8	70.1	82.9	97.5	119.5	145.8	159.6	159.7	164.8	181.7	186.8	204.0	221.3
Process (av. 9*)	90.5	73.2	83.6	103.8	123.0	149.1	161.9	161.1	166.6	183.4	188.7	206.4	223.6
Food (av. 10*)	92.6	68.5	84.9	104.1	126.1	156.8	169.7	169.2	177.1	194.8	200.7	220.8	239.5
Metal working	92.3	67.9	83.6	110.7	131.2	151.3	161.8	161.8	166.9	184.1	189.3	206.8	225.1
Aircraft	93.0	66.7	85.0	109.8	127.0	162.9	178.3	177.5	186.1	205.8	213.4	236.7	258.5
Mach & parts, elec eq.	92.0	68.0	83.4	106.8	130.3	156.6	167.4	167.7	175.0	194.6	200.2	218.7	238.2
Textile	91.1	67.8	83.7	101.8	122.1	146.6	157.4	157.3	165.9	199.8	206.6	228.9	247.9
Woodworking	92.0	67.2	83.6	100.9	123.0	149.6	160.4	160.4	165.5	182.3	187.5	204.7	222.2
General (av. 7*)	95.5	68.8	84.6	103.2	122.0	149.7	162.0	161.8	168.2	185.0	190.7	209.4	226.6
Cold storage—refrig	92.0	70.0	82.1	101.7	125.7	163.2	176.6	175.8	185.2	204.8	211.6	234.3	254.0
Contractors' equipment	91.0	71.9	82.4	102.5	124.2	150.3	161.1	161.1	166.2	183.0	188.2	205.6	224.1

* In each of these groups, MARSHALL AND STEVENS reports separate comparative equipment cost trends for: COMMERCIAL: Apartment, bank, church, hotel, library, restaurant, school, store, theatre, hospital, dwelling, office GENERAL: Laundry, mining and milling, motion picture, printing, shipbuilding, warehouses, logging

PUBLIC UTILITY: Steam power, electric power
PROCESS: Distillery, cement, chemical, glass, petroleum industry, paint, paper, rubber, clay products
FOOD: Bakery, bottling, brewery, candy, cannery-fish, cannery-fruit, creamery, dairy (flour cereal feed), packing-fruit, packing-meat

from 30 T.P.H. to 250 T.P.H.*

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THE LITTLE MONSTER®

This complete asphalt mixing plant on wheels is designed for fast moving, fast set-up and substantial daily production.

Plant shown, owned by a State Highway Department is complete including two MADSEN 32" x 10' Dryers, a MADSEN 2-compartment portable feed bunker and dual cold stone elevators. Mixer unloading skip . . . loads asphalt into trucks. Plant is rated at 30 T.P.H. on a one minute mixing cycle.

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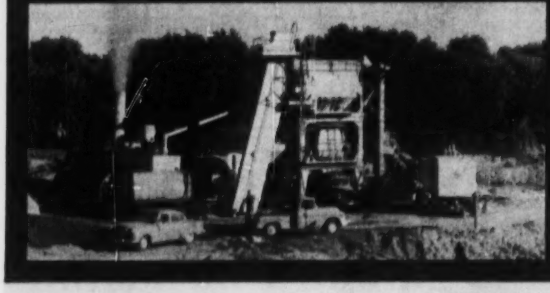
A small plant with big plant features. The 2000-lb. SPECIAL is ideal for the not-too-large contractor, the municipality and the large contractor who wants a small type of operation for producing approximately 480 tons per 8-hour day. It's an ideal plant for handling those jobs up to the 10,000-ton class.



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For information on the MADSEN Asphalt Plants shown above, the MADSEN 3000-lb. Plant or the new MADSEN "HOT ROD" Asphalt Plant . . . (available in 3000-lb., 4000-lb. and 5000-lb. capacities) . . . ask your MADSEN Distributor or write MADSEN WORKS, Baldwin-Lima-Hamilton Corporation, P.O. Box 38, La Mirada, California

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Boeckh Index of Building Costs

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U. S. AVERAGE

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	101.4	102.5	102.5	102.8	101.3	102.2	100.8	101.7	102.2	104.6
1939	101.2	104.4	104.1	111.2	109.4	101.3	110.4	105.0	112.1	113.3
1946	161.8	161.9	161.7	154.0	154.8	165.6	145.0	158.7	154.8	156.0
1949	213.8	215.6	215.0	208.1	208.4	218.4	195.5	211.9	208.7	211.4
1955	257.6	263.5	262.8	264.3	260.1	262.9	253.1	261.1	268.9	272.1
1956	275.1	283.5	283.1	290.5	284.7	280.0	287.9	283.3	300.2	300.1
Aug. 1957	275.2	283.6	283.2	290.6	284.8	280.2	287.9	283.3	300.2	300.1

ATLANTA AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	82.7	87.0	84.2	83.7	87.0	82.9	94.5	84.7	87.5	86.8
1939	82.8	86.0	86.1	95.1	95.0	80.6	96.2	88.6	94.6	97.4
1946	149.2	148.1	148.2	136.8	139.9	151.7	130.0	146.8	135.1	136.4
1949	189.9	189.3	189.3	180.6	185.4	191.7	172.7	186.5	177.5	180.8
1955	255.1	225.3	225.4	229.0	231.6	229.5	231.9	221.9	231.8	231.5
1956	235.7	237.2	237.4	241.7	244.3	239.1	247.8	235.3	246.4	244.4
Aug. 1957	241.3	243.6	243.8	252.0	253.0	244.7	262.6	242.0	258.8	255.6

BALTIMORE AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	107.2	112.0	107.6	100.6	100.7	106.3	95.5	106.8	96.8	101.2
1939	93.5	95.5	95.6	99.3	99.2	94.0	101.7	96.6	101.4	100.2
1946	163.1	161.7	162.2	149.1	150.8	167.6	138.9	158.8	150.0	148.2
1949	216.4	217.4	217.3	204.5	204.8	220.5	191.8	216.6	204.6	208.5
1955	253.1	255.7	256.2	246.7	247.0	257.2	239.8	253.8	252.8	250.4
1956	266.6	267.5	268.6	260.6	262.0	271.3	260.3	265.2	269.1	262.7
Aug. 1957	272.9	277.4	278.0	277.0	275.2	278.1	280.4	275.5	287.9	283.9

BIRMINGHAM AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	91.7	96.7	94.1	95.5	96.8	90.2	97.5	94.6	96.3	96.3
1939	87.8	90.9	91.5	96.1	96.2	84.9	96.9	95.1	95.6	96.3
1946	149.3	147.4	147.9	137.3	139.4	149.7	128.1	145.4	135.2	137.4
1949	188.2	187.2	187.6	178.9	182.0	192.8	172.6	183.7	177.7	180.0
1955	222.2	224.7	224.8	225.0	224.8	225.7	222.6	224.0	227.7	230.3
1956	234.7	239.8	240.1	240.1	239.9	236.3	236.8	241.9	243.5	246.5
Aug. 1957	237.7	242.6	243.6	246.3	247.3	239.1	249.1	245.2	252.0	251.4

BOSTON AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	116.3	120.3	115.4	106.2	107.0	118.8	106.3	112.5	108.7	105.8
1939	106.2	110.4	110.1	116.3	113.7	105.7	114.2	111.5	118.2	118.5
1946	167.0	166.5	166.0	156.8	156.6	172.1	147.1	161.1	158.5	160.4
1949	223.0	226.5	225.9	216.7	215.6	227.1	201.3	222.9	218.2	221.9
1955	264.3	271.9	271.9	271.1	267.8	268.8	263.1	269.9	280.7	279.6
1956	277.3	284.7	284.6	284.9	281.7	282.6	279.1	281.6	295.6	293.1
Aug. 1957	286.3	295.9	296.1	302.0	296.0	291.1	300.8	295.7	315.6	311.9

CHICAGO AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	109.2	114.2	109.8	113.2	109.1	112.9	105.2	105.9	112.0	116.0
1939	110.6	112.5	111.1	123.6	118.7	114.2	117.6	109.3	122.6	127.6
1946	168.3	166.0	164.2	158.9	156.9	168.1	144.5	157.4	157.0	162.5
1949	219.2	218.3	216.1	210.6	208.7	229.1	193.3	207.7	210.4	215.1
1955	270.7	272.9	270.2	275.6	267.6	283.2	256.6	260.2	277.8	285.8
1956	279.8	283.1	280.6	287.6	279.6	291.7	272.7	271.3	292.5	298.3
Aug. 1957	287.7	292.9	290.5	304.4	294.6	300.1	295.0	282.6	312.6	317.2

CINCINNATI AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	100.5	105.0	101.3	101.0	100.2	100.2	99.6	103.1	100.6	101.0
1939	103.3	106.2	105.9	113.9	110.4	103.3	111.7	107.1	113.7	116.5
1946	165.6	166.8	166.7	154.5	154.7	167.5	140.7	166.4	154.4	156.1
1949	214.1	216.6	215.8	207.5	206.0	217.9	193.5	214.1	208.4	212.2
1955	255.0	264.2	262.9	266.1	257.9	258.5	249.6	266.0	270.2	276.4
1956	266.7	276.2	275.4	280.0	272.0	270.7	268.3	277.7	286.4	291.1
Aug. 1957	275.0	286.0	284.9	294.2	284.6	279.5	287.7	288.9	303.8	306.4

CLEVELAND AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	107.2	113.4	108.5	111.3	108.3	109.0	103.0	107.2	110.5	114.8
1939	106.2	109.6	109.5	115.3	112.8	107.5	112.9	109.5	117.7	118.0
1946	169.2	169.4	168.7	160.2	159.9	174.1	146.4	164.3	161.0	165.9
1949	224.8	225.7	223.6	216.0	213.0	233.0	198.5	218.0	217.2	220.9
1955	273.9	280.2	277.7	281.8	272.6	284.1	263.5	273.4	287.7	292.8
1956	286.7	294.4	291.7	296.3	286.1	296.8	277.9	288.8	303.0	308.8
Aug. 1957	296.3	307.6	305.3	314.6	301.9	304.7	299.4	305.8	324.5	328.6

DALLAS AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	103.1	107.3	103.2	98.9	99.1	103.6	100.5	100.9	99.4	99.7
1939	95.1	95.8	96.7	98.8	100.2	94.8	106.6	96.0	101.9	98.9
1946	150.2	148.8	149.4	139.8	144.4	153.5	140.3	144.6	142.6	141.1
1949	207.2	206.2	206.9	197.1	201.3	210.3	197.1	203.2	201.5	195.4
1955	240.0	241.5	242.6	242.7	244.3	245.8	252.6	238.8	250.6	244.3
1956	251.5	254.3	255.5	253.9	256.0	254.6	263.3	253.8	262.8	255.1
Aug. 1957	260.3	265.8	267.3	265.8	265.9	260.7	276.4	269.0	276.9	268.3

DENVER AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	95.0	99.7	95.5	102.4	99.6	95.5	105.5	94.6	101.4	108.0
1939	112.1	112.0	111.2	116.1	114.4	114.3	118.7	109.5	117.0	117.8
1946	160.1	160.3	150.4	155.3	157.9	164.0	155.6	156.8	160.0	158.3
1949	212.9	215.8	215.9	211.0	213.1	216.2	207.0	214.3	214.6	215.3
1955	260.9	266.6	266.3	266.3	264.7	264.2	261.9	265.4	271.7	273.2
1956	269.3	274.9	274.9	275.8	275.3	273.4	277.6	273.7	285.1	282.3
Aug. 1957	274.1	283.1	283.2	287.2	284.5	276.3	290.6	286.2	298.1	294.4

DETROIT AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	103.3	108.4	104.3	102.9	102.4	103.7	103.1	103.5	103.3	104.4
1939	98.8	102.7	102.9	108.6	107.5	98.7	108.8	104.2	111.4	110.1
1946	165.9	165.9	165.8	157.4	157.9	171.3	147.5	160.9	160.0	159.7
1949	221.0	222.6	221.9	212.2	211.5	227.0	196.8	216.8	214.2	215.9
1955	272.2	279.2	277.4	281.5	272.7	280.6	265.3	273.4	287.6	292.7
1956	284.9	292.1	290.3	294.6	285.7	293.1	279.7	287.1	301.4	305.3
Aug. 1957	290.0	299.1	297.9	305.7	295.4	297.3	297.0	296.9	316.4	317.4

KANSAS CITY AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	100.3	106.5	102.2	105.7	103.3	101.1	105.9	101.9	107.5	108.8
1939	104.4	109.9	109.8	118.3	115.4	103.8	117.2	113.0	120.0	121.6
1946	166.5	165.6	165.4	158.2	159.5	172.3	151.0	159.8	159.3	160.3
1949	215.9	216.7	216.3	209.0	211.1	221.8	199.4	210.0	211.3	211.5
1955	261.1	266.2	265.9	263.6	260.4	267.9	254.3	261.2	268.8	273.1
1956	268.5	273.4	272.6	273.5	270.9	275.5	268.8	268.0	280.0	283.8
Aug. 1957	273.9	279.3	278.7	282.9	279.0	281.2	283.2	275.1	291.8	293.1

LOS ANGELES AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	92.7	97.9	93.5	98.8	96.8	93.5	97.0	91.3	97.5	103.1
1939	93.6	97.2	97.5	103.7	105.0	95.6	109.5	96.8	106.2	104.9
1946	155.1	156.1	156.2	155.3	156.7	160.1	158.3	150.9	160.0	158.7
1949	203.2	207.0	206.0	209.9	210.7	205.3	201.2	201.8	210.2	212.4
1955	256.6	262.1	260.9	269.3	265.5	263.6	262.0	254.8	273.9	278.0
1956	266.7	272.6	271.7	282.9	278.7	274.4	278.6	265.0	289.3	292.9
Aug. 1957	272.2	280.0	279.2	298.6	293.1	280.0	307.6	273.0	311.6	309.2

MINNEAPOLIS AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	92.8	98.2	94.6	95.6	96.1	92.8	100.0	93.9	97.9	98.4
1939	101.9	105.0	104.2	113.5	110.7	102.7	113.4	103.6	114.5	117.2
1946	163.7	167.0	167.5	156.5	155.7	164.9	142.6	168.2	157.2	159.5
1949	[illegible]	218.7	217.7	205.1	206.9	224.4	192.6	211.7	205.8	208.0
1955	264.9	272.4	271.4	266.8	262.4	269.0	251.4	272.4	271.7	276.6
1956	276.8	286.0	285.6	281.2	277.4	279.6	269.3	287.7	289.2	290.9
Aug. 1957	283.8	294.9	295.0	293.9	288.5	286.3	289.7	298.4	306.4	305.0

NEW ORLEANS AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	93.3	96.3	93.4	86.5	90.6	93.3	93.7	91.5	89.5	86.5
1939	89.0	90.3	91.3	95.4	98.3	88.1	102.8	91.7	98.5	94.9
1946	148.9	147.7	148.2	138.6	142.8	151.2	138.7	145.4	142.0	138.7
1949	201.6	201.4	202.0	188.8	194.6	204.9	186.0	200.0	191.8	189.8
1955	236.6	238.7	239.3	236.5	240.1	240.5	234.9	237.2	241.1	238.7
1956	244.9	246.5	247.2	244.7	249.2	249.6	247.1	244.3	251.0	247.3
Aug. 1957	251.9	255.6	256.4	255.6	258.1	254.8	259.7	257.3	263.4	258.6

NEW YORK CITY AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	133.3	138.4	131.9	122.8	120.4	137.5	113.1	127.4	123.2	125.3
1939	122.1	123.3	122.5	130.6	125.9	125.6	123.7	119.6	130.0	133.3
1946	182.4	181.8	181.1	177.2	174.6	188.1	158.6	177.4	174.8	179.0
1949	240.8	243.7	242.7	242.8	238.2	247.5	217.3	238.3	240.0	246.4
1955	286.0	293.1	292.1	300.0	290.9	292.4	277.5	288.8	302.4	308.3
1956	302.2	310.8	309.7	320.1	309.6	309.1	299.3	306.9	324.5	328.6
Aug. 1957	310.7	321.0	319.5	336.8	323.1	319.2	321.0	317.6	344.6	349.5

PHILADELPHIA AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	100.3	106.3	103.7	105.9	103.1	98.1	101.9	104.2	104.1	107.5
1939	99.2	102.6	102.9	105.7	104.1	98.2	102.0	105.0	105.5	106.7
1946	165.0	163.9	164.9	153.2	154.6	169.0	141.2	161.1	152.7	154.0
1949	220.5	220.6	220.3	209.0	209.0	224.3	190.3	216.3	205.6	209.9
1955	270.0	275.8	275.2	271.5	264.9	274.0	248.7	275.4	271.1	278.5
1956	27.95	284.7	284.4	282.1	277.0	284.3	268.6	283.3	285.7	288.5
Aug. 1957	285.0	291.0	290.4	293.1	287.2	290.5	281.9	289.1	298.4	300.0

PITTSBURGH AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	113.3	118.8	112.8	111.2	107.1	115.4	89.6	112.2	104.6	112.9
1939	113.8	117.0	115.7	117.5	114.2	114.2	109.8	116.5	116.9	119.1
1946	169.5	169.0	168.0	156.6	155.3	173.5	140.1	166.4	153.2	158.9
1949	227.1	229.1	227.7	215.6	212.2	231.3	186.9	227.0	209.8	219.8
1955	270.3	277.2	275.9	270.9	264.1	274.3	246.1	277.1	271.6	278.4
1956	281.1	288.0	286.7	283.4	277.0	286.1	262.8	287.1	285.8	291.9
Aug. 1957	288.7	297.0	295.8	300.1	292.3	294.9	287.1	295.7	307.2	309.4

ST. LOUIS AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	118.6	121.1	115.7	109.9	108.8	121.3	103.3	111.7	107.7	109.3
1939	107.0	110.2	109.9	118.7	116.4	107.6	114.3	110.3	119.2	119.8
1946	167.4	167.1	166.2	159.1	158.9	171.7	145.3	154.8	158.1	161.1
1949	220.7	221.4	220.7	212.8	212.4	226.8	197.5	217.3	213.6	215.7
1955	266.5	273.3	272.2	272.2	265.7	272.6	255.0	271.5	276.5	281.3
1956	280.3	288.7	287.6	287.9	280.2	287.8	271.8	288.3	293.3	299.2
Aug. 1957	284.6	293.0	292.2	297.0	289.1	291.2	289.7	291.7	306.1	308.3

SAN FRANCISCO AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	87.7	93.7	90.4	97.5	96.5	86.1	95.5	91.8	95.9	99.0
1939	99.2	105.7	104.5	117.4	114.4	97.6	114.9	107.4	116.5	121.9
1946	157.5	159.7	160.0	157.9	159.0	160.5	151.5	158.4	160.0	159.3
1949	207.1	213.0	212.8	214.0	213.9	210.0	203.9	213.9	216.1	219.8
1955	259.6	268.0	267.2	275.0	269.5	264.6	262.9	266.8	279.6	284.4
1956	270.0	279.0	278.3	288.9	283.4	275.6	281.6	277.3	295.8	298.6
Aug. 1957	276.8	288.3	287.6	305.0	296.1	280.7	300.2	289.8	314.2	318.0

SEATTLE AREA

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	84.5	92.2	89.2	101.7	95.1	82.4	100.8	92.2	100.5	105.9
1939	96.7	104.4	103.8	119.2	114.9	94.4	115.1	108.3	118.7	125.3
1946	152.9	158.3	157.9	161.2	159.8	154.3	156.0	158.9	164.2	167.1
1949	203.9	214.3	214.0	220.7	218.1	205.2	209.9	218.0	225.3	228.5
1955	243.3	260.6	260.5	273.7	266.3	241.8	261.9	269.7	282.4	287.3
1956	254.0	273.5	273.7	288.5	280.6	251.5	279.1	285.3	299.0	303.4
Aug. 1957	255.7	277.6	278.1	299.9	290.5	252.7	298.6	290.9	314.4	315.4

WASHINGTON, D. C.

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc
1926-29	106.6	107.7	107.9	107.1	105.9	106.0	104.0	108.0	106.4	108.4
1946	168.5	166.2	167.1	157.1	158.2	173.6	145.2	162.6	157.2	156.6
1949	223.1	223.3	223.1	213.5	212.6	227.2	194.8	218.6	210.4	214.6
1955	262.6	264.4	264.7	262.5	260.2	269.6	254.3	258.8	267.9	267.3
1956	272.5	274.4	274.1	274.0	272.1	280.4	272.4	267.5	282.6	279.5
Aug. 1957	282.6	286.8	287.2	292.5	286.8	289.9	293.1	281.8	302.5	300.4

Current indexes are calculated upon an actual survey at source of local construction cost conditions. Material prices used are those paid by contractors to material dealers.

Labor rates are current rates paid by contractors — certain corrections being made in certain areas for labor efficiency and labor shortage. Index includes construction overhead sales taxes, compensation insurance and social security. The indexes have been primarily engineered to use as local cost conversion factors to construction cost data released by the Boeckh organization. Complete formula is published in "Boeckh's Index Calculator Table."

Where Boeckh index is shown in these pages on charts or tables for comparison with other building cost indexes, the "National" average for all five Boeckh commercial and factory building indexes in 20 (of 47) U. S. cities is used, converted to 1913 = 100.

HOW ONE COMPANY Saves $50,000 EVERY FIVE YEARS on Concrete Floors

30 years ago, before building a new plant, this company made a five year study of floor costs covering:

- initial cost
- cost of maintenance
- cost of repairs
- cost of production shut-downs due to floors

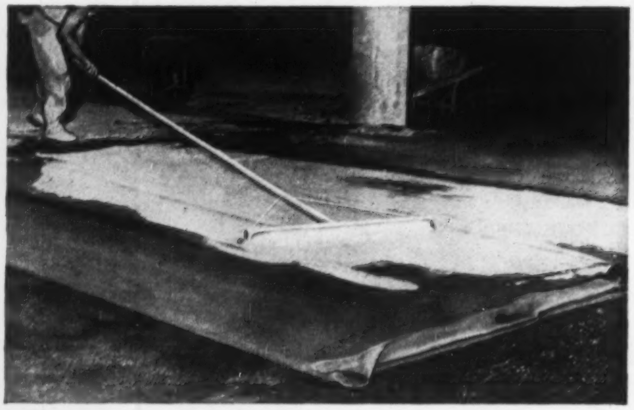
1. *Absorption blankets are placed on top of the freshly placed and screeded floor.*

Here's How the Study was made:

- Test patches of 6 different types of industrial flooring were installed.
- Each section was subjected to all demands of the operation.
- All, save ONE, showed signs of deterioration beginning in the FIRST YEAR.
- After five years ALL, save ONE, had disintegrated.

Result:

400,000 square feet of the successful floor was laid in the new factory. That was 25 years ago!



2. *Kalman crews spread the drying mixture. This acts as a blotting agent and "sucks" up moisture below surface.*

What does this mean:

If one of the 5 unsuccessful floors had been put down without testing—then after five years—

A large portion of the 400,000 sq. ft. of the plant floor would have had to be resurfaced, PLUS, during the five years there would have been

- excessive cost of maintenance
- danger to product because of "dusting"
- production interruptions because of floor repairs.

3. *After proper time has elapsed for obtaining proper water-cement ratio, blanket is removed. Topping now has achieved density to point where it can support weight of man.*

For complete case histories write Kalman Floor Company, Inc., 110 East 42nd Street, New York 17, N. Y.

The plant management estimates that in the five 5-year periods, floor costs would have been in excess of $200,000.

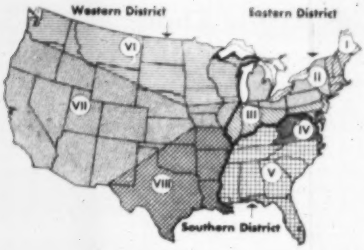
*

The successful floor* is still in excellent condition despite **increased production, new, heavier, faster materials handling equipment**, and **plant modernization**. And cost of maintenance? Less than 1¢ per sq. ft. per year.

KALMAN FLOOR COMPANY, INC.
110 East 42nd St., New York 17

District Offices:
Atlanta
Boston
Charlotte
Chicago
Cleveland
Dayton
Detroit
Houston
Los Angeles
Philadelphia
San Francisco

K*alman
Absorption Process
CONCRETE FLOORS



Railroad Cost Index Road Construction

Interstate Commerce Commission —1910-14 = 100

Dist & Reg.	%	1926	1932	1939	1945	1949	1955	1956
I to VIII	**68 40**	**166**	**131**	**137**	**197**	**270**	**330**	**352**
I East	73 72	173	134	140	206	287	342	363
II East	66 47	168	133	141	202	283	344	367
III East	65 37	168	132	144	205	286	345	368
IV South	63 48	163	126	131	195	259	320	341
V South	68 79	164	129	136	195	265	326	349
VI West	72 27	164	129	132	190	253	317	337
VII West	68 79	166	131	133	188	256	318	339
VIII West	71 97	167	133	140	198	270	329	351

Indexes represent territorial index factors and are not for determining unit reproduction costs for individual roads.

By Accounts	1926	1932	1939	1945	1949	1955	1956
Engineering	166	131	137	197	270	330	352
Other rt of way exp	150	121	135	201	258	286	298
Grading	153	106	90	144	139	147	152
Tunnels & subways	178	119	140	236	339	365	382
Brdg. culv & trestl	170	122	149	240	374	428	456
Elevated structures	165	129	149	249	382	461	501
Ties	173	144	158	241	302	364	389
Rails	144	140	136	152	245	346	376
Other track material	177	163	167	176	278	367	389
Ballast	175	146	143	181	254	314	331
Track laying & surf	188	164	165	273	366	459	485
Fences, snow sheds	178	147	140	189	279	353	374
Station & office bldgs.	184	141	166	244	368	460	480
Roadway buildings	187	140	162	258	386	462	482
Water stations	182	147	166	227	327	400	424
Fuel stations	180	144	159	242	357	434	459
Shops & eng houses	185	137	165	248	379	468	489
Grain elevators	190	137	164	236	367	457	480
Storage warehouses	189	137	166	253	377	474	494
Wharves & docks	177	136	153	255	350	415	434
Coal & ore, wharves	174	136	153	236	341	396	420
Tel & Tel lines	157	121	129	173	250	322	347
Sgnls & intrlocks	169	130	143	176	226	307	332
Power plants	186	138	167	246	386	497	517
Powr trnsmissn sys	176	143	148	180	266	355	384
Misc structures	186	141	161	229	378	465	487
Roadway mach	151	138	154	187	270	349	400
Roadway small tools	190	155	180	200	315	430	500
Public impr const	169	131	142	217	321	357	377
Shop mach	186	155	202	236	324	402	442
Power plant mach	186	155	180	191	242	311	341
Work equipment	180	165	200	254	348	442	483

Ratio of RR costs

Road construction	66.66
Equipment, work	0.54
Equipment, rolling & floating	26.38
General	6.42
Total	100.00

Indexes for 1956, by Engineering Section, Bureau of Accounts, Cost Finding and Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various subcommittees of President's Conference Committee, engineering and trade publications, contracts covering major construction projects, and information furnished by individual carriers.

Handy-Whitman Index — Public Utility Costs

Whitman, Requardt and Associates, Baltimore, Md.

Individual series for 103 cost elements in three classes of utility construction, for six geographic divisions of the United States, are reported semi-annually. Weighting is based on wide experience in cost analysis of plants and construction. Material prices are from ENGINEERING NEWS-RECORD, IRON AGE and various manufacturers; labor rates from BLS, unions and builders associations.

Building Construction—1911 to 1914 = 100

(Complete Index reports 14 Items entering into Building Construction Costs.)
A relates to Reinforced Concrete Bldg.; B relates to Brick Bldg.

	Jan. '26	July '26	Jan. '32	July '32	Jan. '39	July '39	Jan. '42	July '42	July '45	Jan. '49	July '49	July '50	July '51	July '52	July '53	July '54	Jan. '55	July '55	Jan. '56	July '56	Jan. '57	July '57
North Atlantic Division																						
A	213	213	171	159	205	207	250	253	260	436	433	448	479	485	519	534	540	547	608	600	656	676
B	228	229	189	173	211	214	246	250	265	429	421	436	474	479	503	523	525	527	569	572	599	616
South Atlantic Division																						
A	213	215	171	164	204	205	260	267	275	462	453	469	510	517	556	569	578	587	642	649	695	712
B	226	228	185	176	209	211	255	262	277	431	431	439	485	488	516	536	543	551	589	598	625	639
North Central Division																						
A	203	201	169	154	200	200	237	242	253	421	418	437	468	481	520	526	533	542	595	603	642	663
B	212	211	181	164	203	203	229	234	250	389	390	408	440	453	483	497	503	513	548	554	579	597
South Central Division																						
A	192	191	149	144	188	187	232	236	243	411	412	422	454	460	494	504	508	515	566	573	617	630
B	203	204	160	154	191	191	223	227	238	382	382	392	424	438	460	471	478	486	520	535	567	578
Plateau Division																						
A	198	197	153	149	194	194	230	235	239	402	397	417	451	456	480	495	499	506	556	563	610	625
B	211	210	167	163	199	200	221	227	233	396	395	410	442	447	464	481	485	492	520	532	558	573
Pacific Division																						
A	191	190	157	148	192	192	238	241	248	416	415	432	463	468	501	518	524	529	588	588	624	644
B	198	197	164	156	193	193	226	231	242	386	385	400	435	443	466	479	488	498	536	539	561	578

Gas Plant Construction—1911 = 100

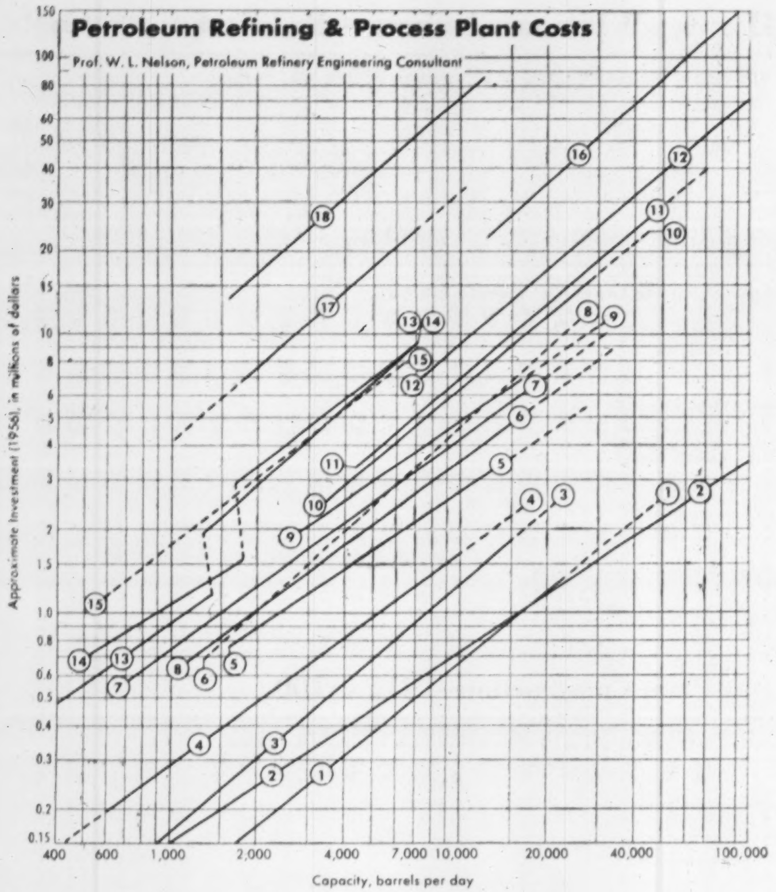
(Complete Index reports 25 Items entering into Gas Plant Construction Costs.)
A relates to Total Constr. & Equip.; B relates to Mech. Equip. Exclusive of Gas Holders.

	Jan. '26	July '26	Jan. '32	July '32	Jan. '39	July '39	Jan. '42	July '42	July '45	Jan. '49	July '49	July '50	July '51	July '52	July '53	July '54	Jan. '55	July '55	Jan. '56	July '56	Jan. '57	July '57
North Atlantic Division																						
A	230	230	202	188	241	249	272	275	288	469	464	476	519	536	561	589	600	605	648	672	695	717
B	212	212	209	195	274	278	297	299	301	447	481	485	549	554	590	609	615	615	672	715	772	799
South Atlantic Division																						
A	219	222	178	175	227	230	261	268	282	464	453	457	507	520	543	568	581	591	623	651	678	693
B	212	212	209	195	274	278	297	299	301	481	482	485	549	554	590	609	615	615	672	715	772	799
North Central Division																						
A	217	218	198	178	232	232	249	254	269	435	434	447	489	503	531	554	565	572	602	630	648	672
B	212	212	209	195	274	278	297	299	301	447	481	485	549	554	590	609	615	615	672	715	772	799
South Central Division																						
A	199	200	171	160	216	217	244	249	261	420	419	429	470	475	496	522	532	538	566	595	614	632
B	212	212	209	195	274	278	297	299	301	447	487	485	549	554	590	609	615	615	672	715	772	799
Plateau Division																						
A	202	202	176	166	216	217	232	237	243	403	398	405	449	460	476	501	511	517	545	575	595	612
B	212	212	209	195	274	278	297	299	301	447	481	485	549	554	590	609	615	615	672	715	772	799
Pacific Division																						
A	205	206	187	177	227	228	253	257	266	433	428	437	480	494	516	544	555	561	599	620	638	661
B	212	212	209	195	274	278	297	299	301	447	481	485	549	554	590	609	615	615	672	715	772	799

Electric Light and Power Construction—1911 = 100

(Complete Index reports 64 Items entering into Electric Light and Power Construction Costs.)
A relates to Total Constr. & Equip. All steam; B to Accessory Electric Equipment; C to Sub-Sta. Equip.

	Jan. '26	July '26	Jan. '32	July '32	Jan. '39	July '39	Jan. '42	July '42	July '45	Jan. '49	July '49	July '50	July '51	July '52	July '53	July '55	Jan. '55	July '55	Jan. '56	July '56	Jan. '57	July '57
North Atlantic Division																						
A	197	194	182	176	224	225	248	248	259	401	400	409	468	480	506	517	519	524	555	577	599	610
B	197	196	192	186	225	224	241	239	237	340	341	360	420	430	457	460	461	468	463	490	520	519
C	184	178	172	168	203	203	217	216	218	306	312	320	359	366	392	396	396	400	417	444	457	464
South Atlantic Division																						
A	201	201	188	180	232	233	262	267	273	430	422	430	490	504	536	547	551	559	589	616	641	651
B	200	203	200	191	239	240	260	262	248	357	356	374	431	442	474	482	485	494	484	512	542	546
C	187	183	180	173	217	218	235	237	228	322	325	333	370	377	409	417	419	425	439	466	479	491
North Central Division																						
A	190	187	186	174	219	218	235	238	243	375	374	382	443	456	489	495	498	504	533	555	575	587
B	189	188	199	186	224	223	229	231	218	309	307	324	382	391	419	424	425	432	429	451	477	478
C	178	171	181	169	203	202	207	209	200	278	280	286	326	333	350	364	365	369	388	409	419	427
South Central Division																						
A	184	183	179	171	218	218	245	246	251	391	390	398	454	465	496	506	508	515	541	567	591	601
B	187	189	200	190	231	230	250	248	235	341	340	357	415	423	453	460	462	470	461	488	517	517
C	175	171	181	173	210	209	226	226	217	310	311	319	352	356	385	392	394	398	412	438	450	457
Plateau Division																						
A	190	188	177	171	218	219	234	236	241	378	378	386	443	454	482	493	495	500	527	553	578	594
B	197	196	194	188	231	232	237	236	225	322	323	341	399	408	437	440	441	446	435	457	482	494
C	185	177	175	171	209	211	213	212	207	289	294	302	341	347	374	378	378	381	392	413	422	442
Pacific Division																						
A	180	178	172	163	216	215	235	242	244	383	380	389	450	459	486	495	499	503	535	557	578	590
B	178	177	182	170	222	222	231	240	225	328	323	343	408	413	437	438	440	447	446	471	496	495
C	167	161	164	155	203	202	210	219	208	298	297	307	357	359	382	384	385	390	411	435	444	451



← Key to Chart

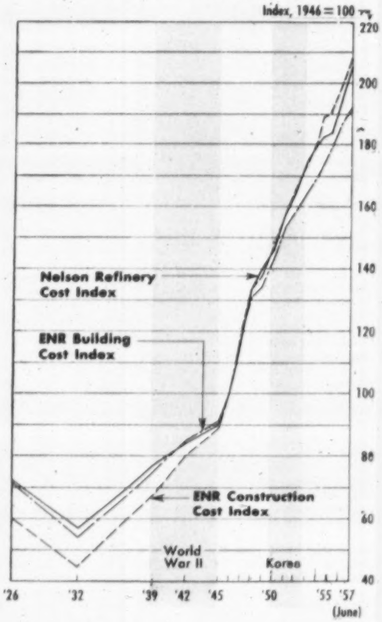
Process Units

1. Vacuum flashing
2. Topping & atmospheric distillation
3. Desulfurization of gasoline (catlytic)
4. Vacuum distillation (lubes)
5. Cracking (thermal)
6. Coking (delayed or fluid)
7. Solvent extration of Deasphalting
8. Reforming (platinum catalyst)
10. Catalytic Cracking, incl feed preparation, gas recovery and polymerization
13. Polymerization (catalytic)*
14. Alkylation*
15. Solvent dewaxing
17. Benzene & toluene recovery (lge. plants)*
18. Lubricating oil mfr. (complete)*

Complete Refineries

9. Topping & asphalt manufacture
11. Topping, Thermal Cracking, Catalytic Reforming and Polymerization
12. Topping, Catalytic Cracking, Catalytic Reforming and Polymerization
16. Complete for all products.

* Per bbl finished product



Petroleum Refinery Costs

The Nelson Index applies to the costs of constructing petroleum refinery and natural gasoline plants since 1946 and projected back to 1926. It is published each month in the Oil and Gas Journal and is based on quotations from manufacturers on equipment used extensively in petroleum refineries and on proportions of steel, common building materials and labor that represent average refinery constructions.

The Materials Component includes two Bureau of Labor Statistics Wholesale Price Indexes—Iron & Steel and Building Materials—and a miscellaneous equipment average published monthly on the Refinery page of the Oil and Gas Journal.

The Materials Component (40% of the total index) is computed by converting each of the two BLS Price Indexes to a 1946 = 100 base. The Iron & Steel Index, on the new base, is then multiplied by 0.6. The BLS Building Materials Price Index, on the new base, is also multiplied by a factor of 0.2. And the miscellaneous equipment price average is multiplied by a factor of 0.2. Then, all three elements are added to determine the Materials Component.

The Labor Component is half skilled and half common labor, taken from ENR. Each of these average wage rates for the current month are divided by their 1946 average to make two wage indexes based on 1946 = 100. Then, each of these indexes is multiplied by a factor of 0.5 and added to get the Labor Component.

Petroleum Refinery Construction Cost Index

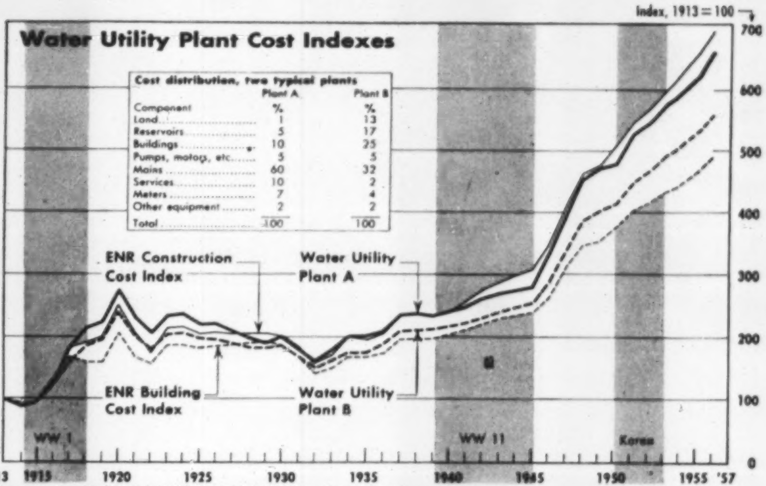
Compiled by W. L. Nelson, Petroleum Refinery Engineering Consultant, published by Oil & Gas Journal, Tulsa, Oklahoma—1946 = 100

	1926	1932	1939	1942	1945	1949	1950	1951	1952	1953	1954	1955	1956	June 1957
NELSON Refinery Construction Index	*72.0	*56.6	*76.8	*83.7	*89.9	139.7	146.2	157.2	163.6	173.5	179.8	184.2	195.3	205.4
EQUIPMENT														
Heat exchangers	75.0	60.0	76.0	93.5	91.9	133.0	140.0	152.0	165.8	174.9	171.7	156.8	190.7	209.0
Instruments (control)	....	90.0	89.5	85.5	90.6	122.0	127.8	142.3	146.2	151.8	154.6	162.9	182.1	186.2
Pumps, compressors	....	....	91.5	87.5	93.9	135.9	138.2	155.9	155.6	162.5	166.5	172.2	164.0	173.5
Electrical equipment	81.0	57.0	68.5	74.0	81.8	130.9	134.9	154.3	152.4	156.4	160.0	162.5	175.0	187.9
Internal Combustion engines	....	....	84.5	84.5	91.7	124.8	126.0	146.1	146.5	148.1	150.5	153.2	192.0	203.7
Miscellaneous equipment average	*94.0	*79.0	*82.0	*85.0	*90.0	†121.6	†126.2	†145.1	153.3	158.8	160.7	161.5	180.5	192.1
MATERIALS	....	68.0	82.0	86.3	89.7	143.6	149.5	164.0	164.3	172.4	174.6	176.1	190.4	201.4
LABOR	....	49.0	73.0	82.0	90.0	137.1	144.0	152.5	163.1	174.2	183.3	189.6	198.2	208.1

* Approximate, projection back to these dates from other cost sources.

† Used to compute index until Apr 1952. Slightly different from the average of the miscellaneous equipment items shown

Equipment prices, mainly from manufacturers as quoted to Oil & Gas Journal *Materials Components from Bureau of Labor Statistics Wholesale Price Index, Code 10-1 Iron and Steel and Code 13, Building Materials *Labor, half skilled and half common labor as quoted by Engineering News-Record. For base costs see ENR Oct. 8, 1953, p 115



Cost distribution, two typical plants

Component	Plant A %	Plant B %
Land	1	13
Reservoirs	5	17
Buildings	10	25
Pumps, motors, etc.	5	5
Mains	60	32
Services	10	2
Meters	7	4
Other equipment	2	2
Total	100	100

Henry H. Fick, Weber, Fick & Wilson, Public Utility Consultants, Harrisburg, Pa.

Water Plant Cost Indexes

To tailor a special cost index to the peculiar characteristics of any individual water works property, Henry H. Fick has come up with seven component indexes, one for each major class of water works plant investment.

The way this works is illustrated by the two water utility plant cost indexes, A and B, as shown in the chart. These two plants differ in the ratio of mains to buildings or of services to reservoirs. For example, the distribution of the cost of each plant in each of the seven components is shown in the table in the chart above.

These component indexes are based on the thirteen recognized cost indexes shown in the accompanying table for selected years.

Waterworks Property Cost Index Components

Henry H. Fick, Weber, Fick & Wilson, Public Utility Consultants, Harrisburg, Pa.

Year	Reservoirs	Buildings	Pumps and Motors	Distribution System	Services*	Meters	Other Equipment
1946	346.0	298.7	173.8	360.2	329.9	222.5	185.1
1947	413.2	341.0	210.0	430.5	385.2	235.6	225.3
1948	460.7	394.9	218.8	505.9	439.5	288.9	242.2
1949	477.0	413.2	232.0	519.5	470.5	315.6	237.0
1950	509.6	421.4	251.2	533.3	496.4	336.4	246.3
1951	542.7	448.1	297.0	589.9	528.3	364.5	249.0
1952	569.4	467.1	296.5	613.9	560.1	370.8	248.8
1953	600.0	495.3	308.5	651.6	604.3	384.8	265.7
Dec '53	611.3	507.9	317.0	665.2	620.3	401.0	270.3
1954	628.0	510.2	317.0	673.1	635.1	403.6	270.4
Dec '54	642.7	514.1	317.0	679.5	647.8	405.7	269.7
1955	659.7	523.3	320.3	692.6	665.4	425.0	279.3
Dec '55	673.1	535.9	338.0	707.6	679.9	431.0	287.1
1956	692.4	548.7	371.0	735.9	701.0	460.9	303.1
Dec '56	703.8	562.4	406.0	753.2	717.8	471.6	315.4

Indexes Used to Develop Fick Waterworks Property Component Cost Indexes

Building	1926	1932	1939	1940	1949	1955	Dec. 1955	1956	Dec. 1956
	Indexes, 1913 = 100								
Engineering News-Record Building Cost Index	185.0	140.9	197.4	202.8	351.8	468.8	478.7	490.8	500.2
E. H. Boeckh & Assoc brick & concr comm & factory bldg, Pittsburgh, Pa, area	210.3	161.7	223.9	224.2	413.2	523.3	535.9	548.7	562.4
ICC Railroad constr index, station & offi buildings, Region 111 (1910-14 = 100)	185.0	142.0	168.0	177.0	369.0	466.0	.....	.....	.....
Handy-Whitman brick buildings index, North Atlantic Division	229.0	175.3	214.0	218.3	423.8	536.0	569.0	578.0	599.0
Materials									
6-in & larger cast iron pipe, Delaware River Foundries#	220.9	139.3	212.9	223.1	415.2	524.6	537.8	564.2	582.0
3-in & under steel pipe, private sources *	187.5	171.9	155.4	155.4	249.7	349.2	360.2	372.3	389.8
Motors, based on Handy-Whitman Index, North Atlantic Division	134.2	134.0	147.8	147.0	232.0	320.3	338.0	371.0	406.0
Contractors' equipment, based on Marshall & Stevens index	158.7	114.1	130.8	132.4	255.7	298.7	309.0	326.3	341.4
Office equip, based on Marshall & Stevens index	136.8	101.1	123.5	127.2	220.9	262.0	267.4	282.6	292.6
Meters, private sources	162.5	162.5	147.7	147.7	265.9	351.7	356.2	385.8	395.9
Common Labor, based on Engineering News-Record labor index, 20-cities average	288.4	224.7	359.5	367.9	763.2	1,084.7	1,103.7	1,136.8	1,152.6
Construction, based on Engineering News-Record Construction Cost Index	208.0	157.0	235.5	242.0	477.0	659.7	673.1	692.4	703.8
Gas utility costs, based on Handy-Whitman index, North Atlantic Divison	212.0	174.5	229.6	235.2	432.9	569.0	600.0	621.9	643.5

Replaces Index based on Iron Age Index
* Replaces wrought iron pipe in the SERVICES INDEX 1913 to date (see table, upper right)

Distribution Mains Cost Indexes

The Handy-Whitman Index of Water Distribution Main construction costs is one of several new water utility cost indexes that have been compiled by Whitman, Requardt & Associates, Baltimore, Md., for use in the water works industry.

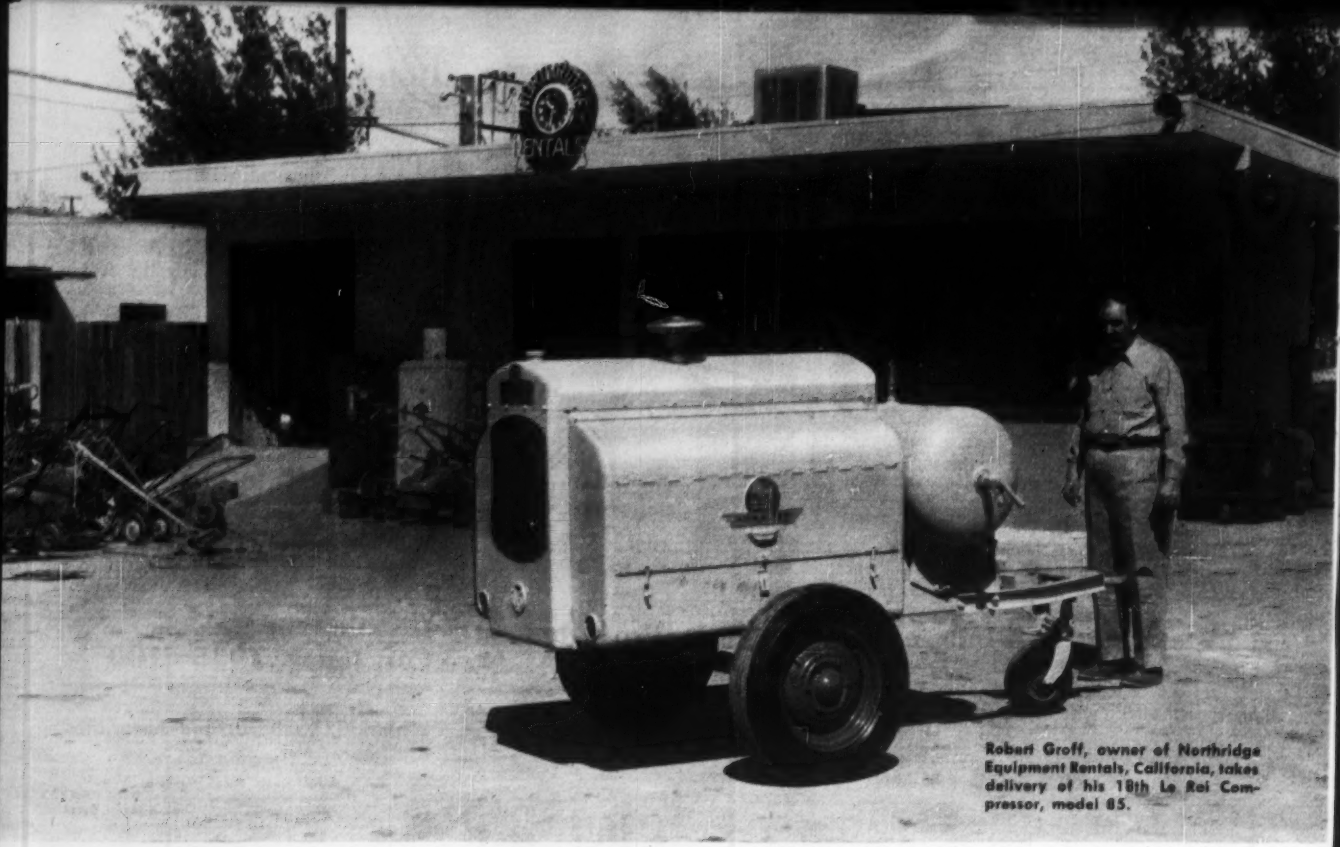
The data for computing the new indexes is based on this company's own records gathered during more than 40 years of practice in water works engineering and also on records obtained from water systems throughout the country.

Indexes covering six different regions of the country are compiled on a semi-annual basis as of January 1 and July 1 for each year.

Distribution Mains Cost Index, 1936=100

Whitman, Requardt and Associates, Baltimore, Md.

Year	North Atlantic	South Atlantic	North Central	South Central	Plateau	Pacific Coast
1912	46	50	45	54	53	49
1913	48	56	48	55	54	53
1914	43	54	47	54	52	49
1915	46	57	50	58	55	52
1916	55	64	57	68	63	66
1917	84	93	83	99	96	93
1918	95	110	94	108	106	101
1919	101	118	101	125	111	109
1920	113	129	113	139	120	122
1921	111	115	108	130	113	112
1922	103	105	99	115	103	103
1923	105	111	102	115	106	105
1924	110	116	107	119	108	110
1925	107	117	103	113	107	105
1926	109	118	103	112	104	104
1927	105	103	99	107	96	102
1928	100	99	96	101	92	98
1929	103	101	97	103	94	99
1930	103	100	96	101	95	98
1931	100	98	93	95	90	92
1932	90	89	82	87	86	83
1933	90	90	85	92	91	90
1934	97	104	92	99	98	97
1935	99	105	93	100	100	99
1936	100	100	100	100	100	100
1937 Jan	103	102	103	101	103	104
Jul	111	109	108	105	111	111
1938 Jan	111	111	110	107	111	114
Jul	111	112	110	108	110	115
1939 Jan	110	111	108	105	108	113
Jul	111	113	108	106	108	113
1940 Jan	113	113	110	109	110	112
Jul	114	111	110	111	110	109
1941 Jan	115	117	111	112	112	114
Jul	117	123	114	114	116	119
1942 Jan	121	131	116	120	117	124
Jul	125	137	119	126	118	128
1943 Jan	125	138	119	131	118	128
Jul	126	138	119	136	118	129
1944 Jan	127	140	120	136	120	130
Jul	128	142	121	136	121	131
1945 Jan	129	144	122	135	121	131
Jul	131	147	124	133	122	132
1946 Jan	135	155	129	140	126	139
Jul	148	173	144	157	140	156
1947 Jan	162	190	158	172	155	172
Jul	177	204	171	190	171	189
1948 Jan	188	217	181	197	179	197
Jul	211	241	199	213	196	215
1949 Jan	216	247	208	226	205	223
Jul	210	245	203	223	197	218
1950 Jan	215	241	206	227	202	220
Jul	220	241	210	230	204	221
1951 Jan	226	253	217	246	214	232
Jul	230	264	224	249	219	238
1952 Jan	233	264	225	249	221	242
Jul	238	272	233	257	226	245
1953 Jan	237	271	233	256	228	244
Jul	247	282	246	267	231	255
1954 Jan	254	292	252	274	237	261
Jul	262	297	259	285	247	272
1955 Jan	263	301	260	285	248	273
Jul	267	310	265	292	253	278
1956 Jan	284	321	273	299	261	293
Jul	288	330	281	310	272	296
1957 Jan	297	344	287	317	280	302
Jul	306	347	298	325	286	314



Robert Groff, owner of Northridge Equipment Rentals, California, takes delivery of his 18th Le Roi Compressor, model 85.

"Here's How I Make Money on Compressor Rentals"

LeRoi Compressors give top performance, require little maintenance, bring maximum profits from satisfied customers.

New units rented out minutes after delivery.

"If I have to make two service calls a month on a rental compressor, I lose the profit on that month's use," says Robert Groff, owner of Northridge Equipment Rentals, Northridge, California.

"That's why I always choose Le Roi and now own eighteen," says Groff. "They run day after day with little care, attention, or upkeep."

Dependability and performance are the cornerstones of Groff's successful business. His customers expect trouble-free equipment, economical in operation, and Groff sees that they get it! No company, he says, can hope to succeed in a rental business if they put their money into inferior equipment.

So much in demand are Le Roi Compressors that the eighteenth unit, shown above, was rented out minutes after delivery.

The Le Roi Air Compressor units rented out by Groff have a capacity of 85 cfm. They're ideal where portability is important . . . they trail well behind vehicles, and are balanced so that one man can easily position them on the job-site.

They're easy to operate, too. One control — the starter button — gives you 85 feet of air at 100 pounds pressure. That's more than ample for powering a heavy breaker. They are a perfect power source for Le Roi Newmatic Air Tools.

There's a big, lockable tool box on each unit — weathertight, and large enough to hold air tools, hose, and accessories.

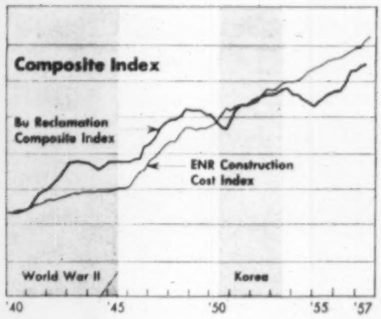
Other Le Roi Compressors range in capacity from 105 to 600 cfm. All of them feature Le Roi's integral packages — proved air sources with power matched to the compressor by a manufacturer who knows both engines *and* air.

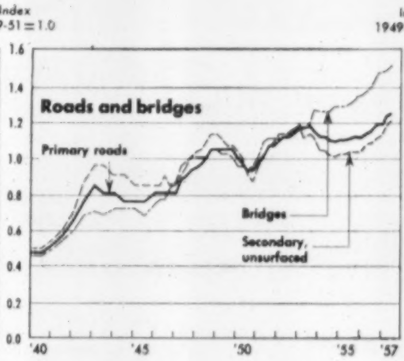
The qualities that make Le Roi air compressors money-makers in rental service are the same qualities that make them the favorite of owners, everywhere.

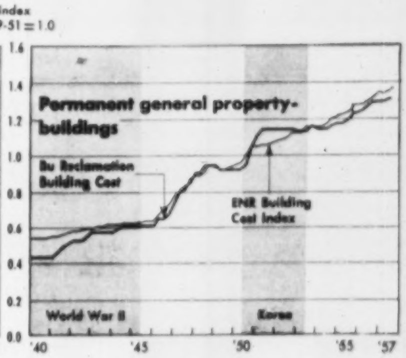
Whether you rent or buy, Le Roi's can be counted on for dependable, trouble-free operation.

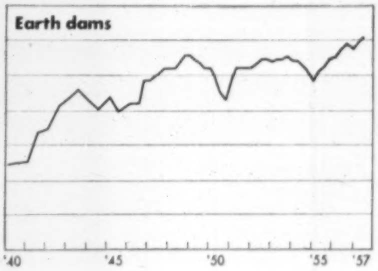
PC-71

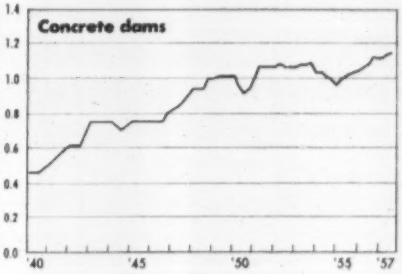
LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

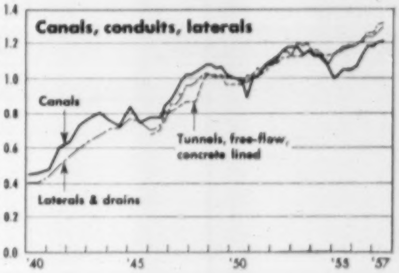












Irrigation and Hydro-power Construction Cost Indexes—1949-51 = 1.0

U.S. Bureau of Reclamation Office of Assistant Commissioner and Chief Engineer, Denver, Colo.

Class of Construction	Conv. fact*	1940		1945		1946		1947		1948		1949		1950		1951	
		Jan.	July	Jan.	July	Jan.	July	Jan.	July	Jan.	July	Jan.	July	Jan.	July	Jan.	July
Composite index	2.12	0.47	0.47	0.76	0.76	0.78	0.87	0.86	0.94	0.99	1.01	1.04	1.04	1.02	0.95	1.01	1.07
Dams, earth	2.00	0.50	0.51	0.89	0.80	0.85	0.85	0.98	1.02	1.05	1.08	1.12	1.08	1.05	0.92	0.98	1.05
Dame, concrete	2.11	0.47	0.47	0.76	0.76	0.76	0.76	0.83	0.88	0.95	0.95	1.00	1.02	1.02	0.93	1.02	1.07
Pumping plants, bldg & equip	2.06	0.48	0.48	0.67	0.66	0.69	0.73	0.80	0.90	0.95	1.01	1.02	1.00	0.97	0.97	1.04	1.12
struct, reinf conc, & improv	2.31	0.43	0.44	0.70	0.68	0.68	0.70	0.80	0.95	1.00	1.01	1.06	1.00	0.98	0.98	1.02	1.08
equipment	1.81	0.55	0.55	0.61	0.61	0.70	0.78	0.78	0.82	0.87	0.97	0.98	0.97	0.97	0.94	1.10	1.16
pumps & prime equip	1.80	....	....	....	....	....	....	....	....	....	....	0.94	0.97	0.97	0.94	1.08	1.17
access elec & misc equip	1.86	....	....	....	....	....	....	....	....	....	....	1.05	0.97	0.97	0.94	1.10	1.18
discharge pipes	2.18	....	....	....	....	....	0.69	0.82	0.89	0.92	1.03	1.10	0.96	0.94	0.96	1.08	1.15
Canals	2.16	0.46	0.47	0.85	0.76	0.78	0.78	0.89	0.99	1.02	1.06	1.08	1.07	1.01	1.00	1.00	1.06
Conduits, tunnels, free flow, conc lined	2.26	....	....	....	....	0.68	0.71	0.82	0.86	0.88	0.97	1.02	1.02	0.97	0.97	1.02	1.04
Laterals and drains	2.42	0.41	0.41	0.77	0.76	0.70	0.74	0.86	0.91	0.97	1.01	1.02	1.02	1.00	0.98	1.01	1.03
Primary roads	2.08	0.48	0.48	0.77	0.77	0.82	0.82	0.82	0.91	0.96	1.01	1.06	1.06	1.01	0.94	0.99	1.08
Secondary roads, unsurf	1.98	0.50	0.50	0.86	0.86	0.86	0.91	0.88	0.98	1.04	1.11	1.14	1.08	1.04	0.91	0.96	1.06
Bridges, steel	2.18	0.46	0.46	0.73	0.69	0.76	0.78	0.87	0.96	1.01	1.01	1.06	1.03	0.96	0.94	1.01	1.12
Power plants, hydro, bldg & equip	1.98	0.50	0.51	0.70	0.69	0.71	0.77	0.80	0.88	0.93	0.99	1.04	0.99	0.96	0.96	1.06	1.11
structs, reinf conc, imprv	2.28	0.44	0.45	0.74	0.71	0.70	0.71	0.82	0.95	0.99	1.01	1.05	1.01	0.99	0.96	1.03	1.09
equipment	1.83	0.55	0.55	0.67	0.68	0.73	0.80	0.79	0.84	0.90	0.98	0.96	0.93	0.96	0.96	1.09	1.15
turbines & generators	1.80	0.56	0.56	0.69	0.69	0.76	0.83	0.81	0.83	0.89	0.98	0.97	0.94	0.97	0.94	1.08	1.17
acces elec equip	1.84	0.54	0.54	0.59	0.61	0.65	0.72	0.74	0.89	0.99	1.02	1.01	0.98	0.92	0.95	1.14	1.14
misc equip	1.95	0.51	0.51	0.70	0.71	0.70	0.73	0.76	0.81	0.89	1.02	1.05	0.98	0.97	0.97	1.08	1.13
penstocks	2.18	....	....	....	....	....	0.69	0.82	0.89	0.92	1.03	1.10	0.96	0.94	0.96	1.08	1.15
Transm switchyards & substa	2.03	0.54	0.54	0.59	0.59	0.59	0.70	0.81	0.86	0.92	0.97	0.99	0.94	0.97	0.92	1.11	1.19
Transm lines, wood pole 115kv	2.02	0.50	0.52	0.72	0.82	0.89	0.99	0.99	1.09	1.19	1.24	1.24	1.16	0.99	0.89	0.94	1.09
Transm lines, steel tower 230 kv	1.91	....	....	....	....	....	....	....	....	....	....	....	....	....	0.92	1.02	1.13
Permanent genl property, bldgs	2.26	0.44	0.44	0.62	0.62	0.62	0.66	0.75	0.84	0.91	0.95	0.95	0.93	0.93	0.95	1.11	1.15

Class of Construction	1952		1953		1954				1955				1956				1957		
	Jan.	July	Jan.	July	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July
Composite index	1.10	1.12	1.13	1.16	1.13	1.13	1.11	1.09	1.07	1.09	1.11	1.14	1.15	1.16	1.19	1.24	1.24	1.27	1.29
Dams, earth	1.05	1.10	1.09	1.10	1.09	1.09	1.06	1.03	0.98	1.03	1.05	1.07	1.07	1.08	1.13	1.17	1.15	1.19	1.22
Dams, concrete	1.07	1.07	1.07	1.08	1.04	1.04	1.02	1.00	0.97	1.00	1.02	1.04	1.04	1.06	1.09	1.12	1.11	1.14	1.15
Pumping plants, bldg & equip	1.16	1.19	1.18	1.19	1.24	1.24	1.24	1.25	1.25	1.26	1.26	1.29	1.31	1.33	1.37	1.43	1.43	1.45	1.46
struct, reinf conc, & improv	1.10	1.15	1.17	1.18	1.18	1.18	1.19	1.20	1.19	1.21	1.22	1.24	1.24	1.25	1.28	1.31	1.31	1.32	1.34
equipment	1.22	1.22	1.23	1.23	1.29	1.29	1.29	1.30	1.30	1.30	1.30	1.33	1.38	1.39	1.45	1.56	1.56	1.58	1.58
pumps & prime equip	1.22	1.22	1.28	1.28	1.34	1.34	1.35	1.35	1.35	1.35	1.35	1.38	1.44	1.46	1.54	1.64	1.64	1.66	1.66
access elec & misc equip	1.18	1.18	1.12	1.15	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.23	1.25	1.26	1.30	1.41	1.41	1.43	1.44
discharge pipes	1.17	1.19	1.21	1.25	1.30	1.30	1.28	1.30	1.32	1.34	1.36	1.46	1.47	1.50	1.53	1.66	1.66	1.68	1.72
Canals	1.11	1.16	1.18	1.14	1.13	1.13	1.11	1.08	1.00	1.02	1.05	1.06	1.06	1.08	1.13	1.18	1.18	1.20	1.21
Conduits, tunnels, free flow, conc lined	1.08	1.15	1.13	1.13	1.16	1.16	1.13	1.13	1.14	1.15	1.16	1.17	1.17	1.19	1.23	1.24	1.24	1.26	1.29
Laterals and drains	1.10	1.12	1.14	1.19	1.14	1.14	1.12	1.09	1.15	1.16	1.18	1.18	1.18	1.19	1.20	1.26	1.26	1.31	1.32
Primary roads	1.11	1.13	1.18	1.19	1.13	1.13	1.11	1.10	1.11	1.11	1.12	1.12	1.12	1.14	1.16	1.19	1.19	1.23	1.25
Secondary roads, unsurf	1.14	1.14	1.19	1.14	1.05	1.05	1.03	1.02	1.03	1.03	1.04	1.04	1.04	1.07	1.08	1.11	1.13	1.18	1.21
Bridges, steel	1.12	1.15	1.19	1.20	1.27	1.27	1.27	1.30	1.30	1.30	1.32	1.35	1.36	1.38	1.40	1.47	1.47	1.48	1.52
Power plants, hydro, bldg & equip	1.16	1.19	1.21	1.22	1.24	1.25	1.25	1.26	1.25	1.26	1.26	1.28	1.31	1.32	1.37	1.44	1.44	1.46	1.47
structs, reinf conc, imprv	1.12	1.16	1.17	1.18	1.19	1.19	1.19	1.21	1.19	1.20	1.22	1.24	1.24	1.25	1.28	1.30	1.30	1.31	1.33
equipment	1.20	1.20	1.23	1.25	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.31	1.36	1.37	1.44	1.53	1.53	1.55	1.55
turbines & generators	1.22	1.22	1.27	1.28	1.31	1.31	1.32	1.32	1.31	1.31	1.31	1.33	1.39	1.39	1.46	1.57	1.57	1.58	1.58
access elec equip	1.20	1.20	1.15	1.18	1.22	1.23	1.23	1.23	1.24	1.24	1.24	1.26	1.29	1.30	1.34	1.44	1.44	1.46	1.48
misc equip	1.13	1.13	1.15	1.15	1.17	1.17	1.17	1.19	1.20	1.21	1.23	1.26	1.29	1.31	1.34	1.43	1.43	1.44	1.44
penstocks	1.17	1.19	1.21	1.25	1.30	1.30	1.28	1.30	1.32	1.34	1.36	1.46	1.47	1.50	1.53	1.66	1.66	1.68	1.72
Transm switchyards & substa	1.19	1.22	1.22	1.31	1.37	1.37	1.37	1.38	1.39	1.38	1.38	1.38	1.41	1.43	1.47	1.59	1.59	1.60	1.60
Transm lines, wood pole 115 kv	1.11	1.13	1.11	1.09	1.06	1.06	1.05	1.06	1.08	1.00	1.02	1.06	1.06	1.06	1.09	1.11	1.09	1.09	1.10
Transm lines, steel tower 230 kv	1.13	1.13	1.14	1.18	1.18	1.18	1.18	1.19	1.20	1.21	1.22	1.27	1.28	1.29	1.33	1.39	1.37	1.39	1.43
Permanent genl property, bldgs	1.15	1.15	1.14	1.14	1.15	1.15	1.15	1.17	1.18	1.18	1.20	1.25	1.25	1.26	1.29	1.30	1.30	1.30	1.31

*** Multiplier to convert to 1940 = 1.0 base**

Based on combined costs of material and labor furnished by the contractor, and material and labor furnished by the government on B of R projects in 17 western states and Alaska

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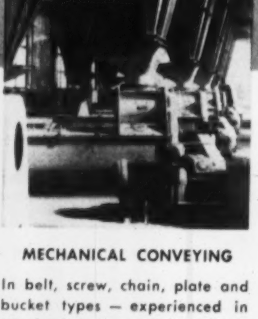

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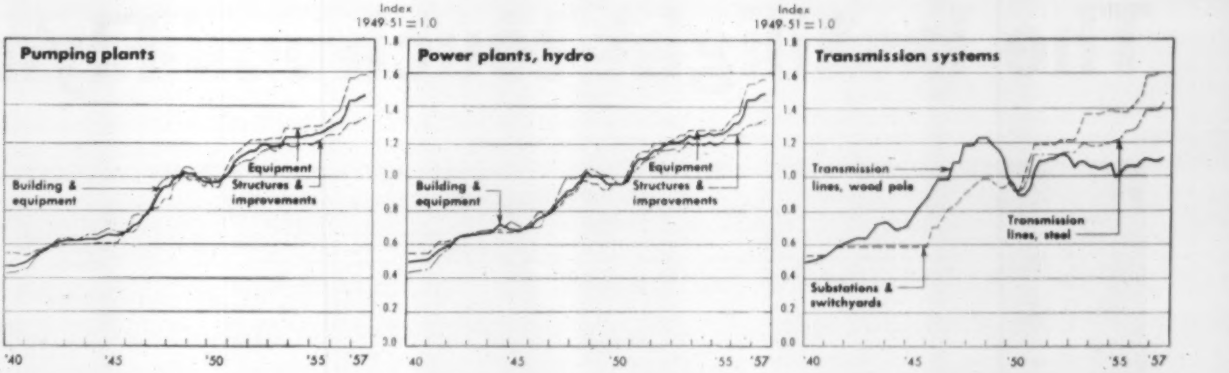
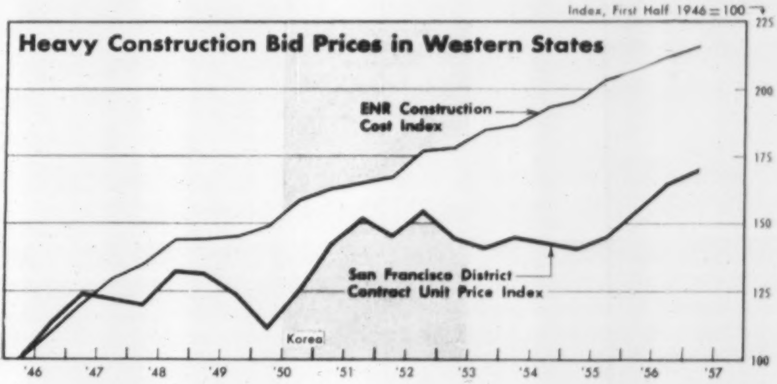


Heavy construction costs in 17 western states and Alaska rose 8% during the 12 months ending July '57, according to the Composite Cost Index of the U. S. Bureau of Reclamation's Denver office. This latest increase brought to 20% the total cost rise measured by this index since its January '55 low. The July '57 value of 1.29, based on 1949-51 as 1.0, set a new all-time high.

The rapid rise in costs was punctuated in spectacular fashion by low bids on three huge projects awarded by the Bureau of Reclamation within the past year. The lowest bids on two sections of the Trinity River Project, Clear Creek Tunnel and Trinity Dam were 44% and 33%, respectively, Bureau of Reclamation's engineering estimates. However, this was not typical. The low bid—opened in April—on Glen Canyon Dam was 20% below the estimate. Moreover, the bureau reported that bids this year on canals have been in line with estimates.

Some evidence that the cost uptrend may be tapering off is that the bureau's Composite Index rose four points in the nine months between October '56 and July '57. This compares with a five point rise in only three months between July and October '56. Moreover it's a bit less than the five point increase in the corresponding nine months July '55 to October '56. However, increasing costs of labor, machinery, cement and steel will probably bring further increases in this last index—particularly because contractors are booking a record volume of heavy engineered construction contracts.

Compared to ENR's Construction Cost Index the Bureau of Reclamation's composite moved up faster in the latest 12 month period. The gap between the two indexes narrowed rapidly (see top left chart on following page). By contrast, the bureau's sub-index for general building has edged up a slight 2% in the past year while ENR's Building Cost Index rose between 3% and 4%. Still, the gap between these two indexes remained very small as of July '57.



Record high prices bid by contractors in heavy construction projects in western states pushed the contract unit price index of the San Francisco District Corps of Engineers nearly 4% higher in the first half of 1957. During the 24 month period since its recent low reached in the first six months of '57, this index has climbed more than 20% (see chart above). This is nearly double the corresponding rise in the ENR 20-Cities construction index.

Contributing to the latest rise in heavy construction bid price increases were substantial increases in: structural concrete, 5%; pavement concrete, 6%; corrugated metal pipe, up 8% for 12 in. and up 10% for 24 in.; reinforced concrete pipe, 36 in., up 5%; and structural excavation, up more than 22%.

Contract Unit Price Index —Western States

Estimates Section, San Francisco District, Corps of Engineers, U. S. Army—1st half 1946 = 100

		1946	1949	1950	1952	1953	1954		1955		1956		1957
		1st half	1st half	1st half	2nd half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half
Index. 1st Hf '46 = 100		100.0	132.2	111.9	155.04	140.50	145.09	142.83	141.37	145.36	154.74	164.12	170.37
Items used in index	Unit	Based on these average unit prices											
Cr rock base course	ton	2.81	2.29	2.37	3.18	3.03	2.96	2.92	3.03	2.90	3.48	3.56	3.41
Plant mix aggregate	ton	4.82	4.43	3.75	5.25	5.16	5.84	5.43	5.86	6.04	6.19	7.25	6.92
Plant mix asphalt	ton	22.00	26.85	18.98	24.60	26.00	21.40	26.00	25.00	19.63	21.74	22.18	21.50
Cover aggregate	ton	5.09	5.65	5.22	6.62	6.44	6.42	6.39	6.63	6.71	6.60	7.34	7.13
Structural concrete	cy	50.65	65.07	54.11	73.20	72.00	67.71	70.41	67.00	74.00	72.00	78.00	82.00
Pavement concrete	cy	13.20	19.69	18.50	28.88	19.00	19.09	21.55	22.00	23.00	24.00	20.00	23.00
Reinforcing steel	cwt	9.60	12.70	11.00	14.60	14.00	14.00	14.00	13.00	13.00	13.00	16.50	17.00
Cement	bbl	2.84	4.98	4.24	4.77	4.91	4.63	4.52	4.68	4.76	5.04	5.21	5.11
CM pipe 12"	lf	2.20	3.03	2.75	3.85	3.78	3.70	3.67	3.60	3.72	3.98	4.13	4.48
CM pipe 24"	lf	4.05	5.26	4.82	6.53	6.75	6.33	6.55	6.84	6.66	6.60	7.29	8.04
RC pipe 18"	lf	3.50	4.27	4.54	5.83	5.51	5.10	5.37	5.15	5.37	5.91	6.25	6.24
RC pipe 36"	lf	8.29	10.47	9.48	13.27	12.66	11.24	11.66	11.62	11.23	11.86	13.08	13.75
VC pipe 6"	lf	1.87	2.39	2.00	3.32	2.87	2.80	2.98	2.75	3.38	3.50	3.55	3.70
VC pipe 8"	lf	2.22	2.80	2.82	3.93	3.46	3.40	3.83	3.36	3.71	3.99	4.36	3.67
Sewer manhole	1/10 ea	16.50	20.80	17.80	26.66	17.60	23.67	23.33	23.70	23.00	24.90	25.40	28.20
Roadway excavation	cy	0.67	.96	.64	1.22	1.15	.87	.90	.80	.95	.92	1.12	1.05
Structural excavation	cy	2.49	4.27	3.14	3.70	4.26	3.72	3.96	3.78	3.48	3.63	4.42	5.42
Watering	M gal	2.13	2.13	1.66	2.22	2.07	1.74	1.70	1.71	1.69	1.76	1.94	1.92
Flat wheel roller	R-hr	5.47	7.82	7.79	8.68	9.36	9.86	7.05	8.50	7.74	8.15	9.03	10.06
Piling, gr wood, fur	lf	0.64	0.65	0.64	1.09	1.38	1.48	1.31	1.17	1.20	1.35	1.18	0.895
Piling, treated, fur	lf	1.25	1.45	1.20	1.93	1.74	1.64	2.01	1.84	1.75	2.00	1.83	2.75
Timber in place	100 fbm	16.60	26.33	21.20	30.50	28.00	42.20	27.50	32.10	36.70	45.20	49.60	50.50
2" Galv steel pipe	lf	1.04	1.38	1.24	1.61	1.45	1.62	1.62	1.65	1.74	1.60	1.68	1.62
Cast-iron pipe 6"	lf	2.86	4.17	3.50	5.57	4.53	4.15	4.34	4.36	3.94	4.54	4.70	5.42
Cast-iron pipe 8"	lf	3.80	6.47	5.35	6.64	5.68	5.04	6.71	4.80	4.79	5.23	5.83	6.07
Gate valve 6"	1/10 ea	7.06	9.70	8.00	12.60	9.30	10.30	10.20	8.85	10.40	12.50	12.40	10.08
Total in dollars		193.65	256.01	216.74	300.25	272.09	280.97	276.80	273.78	281.49	299.67	317.83	329.93

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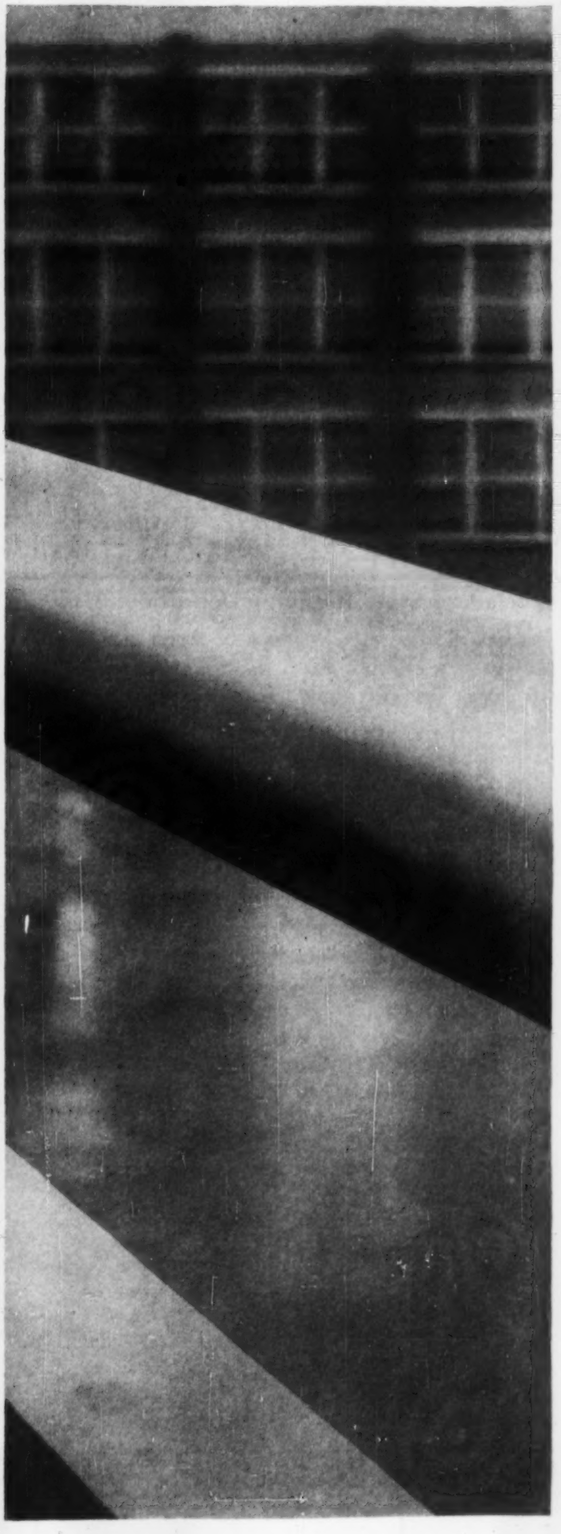
5

aluminum bridge railing



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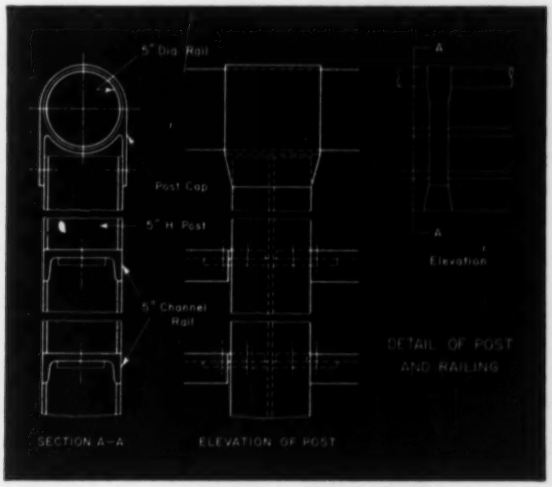
Aluminum rails never need paint, always look new and attractive. Flynn aluminum bridge railing *weighs 66% less than steel.* You can design to less weight yet lose nothing in usability or durability. This is especially important to drawbridges such as the one pictured going up in Wilmington, Delaware. Bridges open faster with less motive power when they weigh less. That means a saving in power machinery.

Flynn bridge railing components are available in a wide variety of standard designs. They can also be extruded and cast to your individual specifications. Deliveries are prompt. And Flynn technical service is at your disposal to assist you.

You'll get complete information quickly by writing or calling any of the Flynn offices listed below.



Details of post used on Walnut Street Bridge, Wilmington, Del. This is one of many possible designs using Flynn standard extrusions and bridge railing components.

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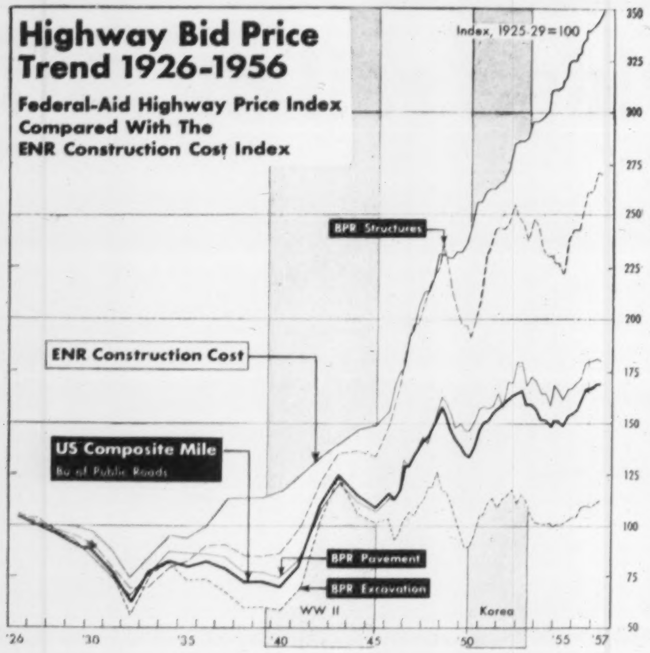


Highway

Faced with increasing costs of labor, cement, steel, machines and working capital, highway contractors have upped their bid prices another notch in many states during the past year. However, the uptrend in prices is not nearly as unanimous as a year ago. Several states report that bid prices have actually turned down this year.

The trend on federal-aid highways, including interstate projects, has been a 6.6% rise in bid prices between the first half of 1956 and first six months of 1957. The Bureau of Public Roads Composite Mile Bid Price Index hit a new all-time high of 169.8 in the second quarter, based on 1925-29 = 100. But there has been very little change in this index since the third quarter of 1956 when steel prices moved up. So far in 1957, the BPR Composite Mile Index shows a slight 1.4% rise compared with a 3.3% increase in the first six months of last year. Moreover, the second quarter index was practically un-

U.S. Composite Standard Mile Highway Bid Price Index

U. S. Bureau of Public Roads, 1925-29 = 100

	Excavation[1] 17,491 cy*		Surfacing[2] 3,726 sy*		Structures				
Year	Bid price	Sub-index	Bid price	Sub-index	Reinf. steel 16,000* lb. Bid price	Struct. steel 4,325* lb. Bid price	Struct. concr. 68* cy Bid price	Comb. Sub-index	Com-posite mile index
'25-'29 = 100	**$0.35†**	**100.0**	**$2.22†**	**100.0**	**$0.052†**	**$0.067†**	**$22.15†**	**100.0**	**100.0**
1926	.36	103.7	2.29	103.1	.053	.074	22.76	103.7	103.4
1930	.30	86.3	1.86	84.1	.045	.061	20.08	89.4	85.7
1932	.18	55.0	1.44	64.8	.034	.046	15.33	68.0	61.0
1939	.21	59.8	1.73	77.8	.044	.059	19.13	85.9	72.6
1940	.21	59.2	1.68	75.6	.045	.063	19.17	87.6	71.6
1941	.24	69.2	1.87	84.1	.054	.076	21.44	100.8	81.4
1942	.37	104.1	2.39	107.9	.065	.090	26.16	122.3	108.8
1943	.44	124.0	2.71	122.3	.067	.095	30.19	134.4	124.9
1944	.37	106.6	2.45	110.6	.064	.089	31.94	136.5	113.1
1945	.36	101.6	2.38	107.4	.062	.077	31.62	132.5	109.0
1946	.35	99.1	2.65	119.3	.075	.113	38.79	164.7	119.0
1947	.38	108.4	3.01	135.5	.093	.132	45.84	196.9	135.0
1948	.42	119.3	3.37	151.9	.108	.158	51.00	223.9	151.2
1949	.38	107.4	3.40	153.1	.104	.146	47.36	210.3	145.8
1950	.33	94.5	3.32	149.8	.100	.139	44.62	199.4	137.7
1951	.39	110.0	3.54	159.5	.120	.180	52.07	237.8	153.7
1952	.40	114.2	3.80	171.3	.124	.186	54.50	247.8	162.5
1953:	**.38**	**108.6**	**3.82**	**172.0**	**.122**	**.186**	**53.53**	**243.8**	**160.2**
Q1	.40	114.8	3.96	178.5	.121	.192	53.91	245.4	165.9
Q2	.39	112.0	3.73	168.2	.120	.180	51.67	237.1	158.5
Q3	.37	105.1	3.81	171.8	.123	.196	54.07	247.6	159.4
Q4	.36	102.3	3.76	169.5	.123	.175	54.48	245.0	156.9
1954:	**.35**	**100.9**	**3.63**	**163.6**	**.116**	**.167**	**50.91**	**229.9**	**151.2**
Q1	.36	101.4	3.63	163.7	.115	.174	52.00	233.9	152.0
Q2	.35	100.9	3.63	163.7	.115	.167	50.61	229.1	151.1
Q3	.36	101.4	3.53	159.2	.117	.167	50.64	229.9	149.2
Q4	.35	100.0	3.72	167.7	.115	.158	50.40	226.8	152.4
1955:	**.36**	**101.9**	**3.67**	**165.3**	**.116**	**.165**	**51.99**	**232.8**	**152.8**
Q1	.36	101.1	3.67	165.5	.113	.157	51.14	227.3	151.8
Q2	.35	100.3	3.60	162.3	.112	.152	50.09	223.3	149.4
Q3	.36	102.3	3.68	165.9	.118	.166	53.47	237.6	154.0
Q4	.36	103.7	3.71	167.3	.122	.187	53.26	243.0	156.0
1956:	**.38**	**108.2**	**3.89**	**175.5**	**.131**	**.202**	**54.33**	**253.8**	**163.3**
Q1	.37	104.8	3.76	169.5	.124	.192	52.42	243.1	157.5
Q2	.38	108.3	3.82	172.2	.128	.197	53.55	249.5	161.1
Q3	.39	109.7	4.00	180.3	.134	.205	55.81	260.5	167.2
Q4	.39	110.0	3.99	179.9	.136	.215	55.53	262.2	167.4
1957:									
Q1	.39	111.7	4.01	180.8	.141	.215	57.46	270.6	169.7
Q2	.40	113.[illegible]	4.00	180.3	.137	.221	57.35	268.7	169.8

[1] Common excav. plus other excav. Items expressed as equivalent common excav.
[2] Portland-cmt. concr. plus other surfacing expressed as equivalent portland-cmt. concr.
* Fixed quantities used for establishing price trend. † Prices used for base year index.

Highway Bid Price Trends

Reported by State Highway Departments to

Region	NEW ENGLAND		MIDDLE ATLANTIC		SOUTH		MIDDLE WEST		
& State	Conn.	Maine	N. Y.	Pa.	Miss.	Va.	Ill.	Mich.	Ohio
Base year	1939	'37-'40	1946	1940	'37-'41	'37-'41	'37-'41	1940	'37-'41
Year, quarter									
1940	93.9	...	.....	100	100.4	95.8	91	100.0	94
1941	116.7	104	.....	111	117.1	112.5	105	112.0	100
1942	141.1	136	.....	138	158.8	149.1	135	138.0	125
1943	.....	150	.....	157	173.7	172.4	132	152.0	138
1944	.....	...	.....	133	196.1	167.2	134	155.5	137
1945	151.5	...	.....	167	234.9	176.9	137	154.3	144
1946	170.1	145	100.0	171	163.4	198.9	142	155.8	155
1947	186.4	173	117.6	201	187.9	205.1	153	151.5	175
1948	211.8	166	125.5	208	197.1	234.5	182	162.0	198
1949	184.6	148	124.6	193	182.7	203.6	162	149.0	170
1950	.....	**153**	**107.8**	**192**	**175.5**	**190.8**	**158**	**151.5**	**180**
Q1	.....	...	133.8	...	.....	.....	...	.....	...
Q2	170.8	...	111.0	...	.....	.....	...	.....	...
Q3	.....	...	103.9	...	.....	.....	...	.....	...
Q4	185.0	...	107.2	...	.....	.....	...	.....	...
1951	.....	**173**	**128.2**	**216**	**206.5**	**247.1**	**189**	**173.0**	**204**
Q1	.....	...	131.1	...	.....	.....	...	.....	...
Q2	213.1	...	127.4	...	.....	.....	...	.....	...
Q3	.....	...	124.4	...	.....	.....	...	.....	...
Q4	223.7	...	133.6	...	.....	.....	...	.....	...
1952	.....	**195**	**127.5**	**205**	**227.4**	**258.4**	**195**	**177.0**	**203**
Q1	.....	...	114.7	...	.....	.....	...	.....	...
Q2	231.9	...	126.0	...	.....	.....	...	.....	...
Q3	.....	...	126.4	...	.....	.....	...	.....	...
Q4	221.5	...	137.1	...	.....	.....	...	.....	...
1953	.....	**170**	**151.0**	**209**	**186.8**	**226.2**	**192**	**178.8**	**211**
Q1	.....	...	139.2	...	.....	.....	...	.....	...
Q2	221.2	...	145.9	...	.....	.....	...	.....	...
Q3	.....	...	170.3	...	.....	.....	...	.....	...
Q4	216.7	...	171.5	...	.....	.....	...	.....	...
1954	.....	**179**	**147.6**	**208**	**195.0**	**203.8**	**187**	**168.0**	**201**
Q1	.....	...	175.4	...	.....	.....	...	.....	...
Q2	221.8	...	144.0	...	.....	.....	...	.....	...
Q3	.....	...	123.5	...	.....	.....	...	.....	...
Q4	224.0	...	139.7	...	.....	.....	...	.....	...
1955	.....	**171**	**131.9**	**199**	**180.7**	**223.4**	**179**	**181.9**	**197**
Q1	.....	...	139.6	...	.....	.....	...	.....	...
Q2	n.a.	...	131.3	...	.....	.....	...	.....	...
Q3	.....	...	130.8	...	.....	.....	...	.....	...
Q4	243.9	...	150.3	...	.....	.....	...	.....	...
1956	.....	**182**	**155.0**	**211.3**	**190.0**	**261.3**	**195**	**185.4**	**213**
Q1	.....	...	176.6	...	.....	.....	...	.....	...
Q2	271.0	...	148.6	...	.....	.....	...	186.8	...
Q3	.....	...	150.6	...	.....	.....	...	.....	...
Q4	288.1	...	159.7	...	.....	.....	...	183.9	...
1957	.....	...	.....	...	.....	.....	...	.....	...
Q1	.....	...	168.0	...	.....	.....	...	172.0	...
Q2	289.2	...	160.8	...	.....	.....	...	.....	...

Prices Up in Some States, Down in Others

changed from the first quarter's value.

This tapering off in the rise shown by the BPR Composite Mile Index may reflect declines in contractors' bid prices in some states. Among those reporting quarterly or semi-annual bid price indexes five states show prices trending downward. (First half of 1957 compared with the corresponding period of last year.) Biggest drops have come in Idaho, 16%, and Oregon, 12%. Michigan and Montana both report an 8% decline in bid prices.

By contrast, six other states report bid prices this year are running higher than in the first six months of last year. Washington State has the largest increase, more than 22%. The California Highway Division's highway price index is up 14% while its bridge index has increased by 10%. More moderate increases of 6%-7% are reported by Colorado, Connecticut and Texas. Slight increases of about 1% are reported by New York and Minnesota.

(The state-by-state tabulation below does not include index values for years prior to 1940, available for some states. For these values, the reader is referred to a table in ENR Dec. 6, 1956, p. 111.)

On the following pages, average unit prices used to compute these bid price indexes are tabulated. In some cases, certain intermediate years have been dropped from the tables and also the description of how each index is computed. This is because the information was reported in previous cost issues of ENR. (For this data see ENR Dec. 6, 1956, p. 109; Sept. 29, 1955, p. 111.)

New England

Two states represent New England in ENR's roundup of state highway bid price indexes. The Maine State Highway Commission computes an annual index based on 1937-40 = 100, which is shown in the table at the left and in the chart at the right.

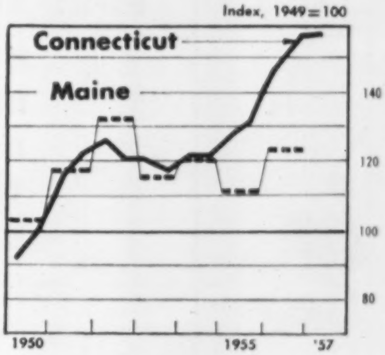
By States—1940-57

Engineering News-Record

Region	WEST OF THE MISSISSIPPI									FAR WEST						
& State	Ark	Colo	Iowa	Minn	Mont	Neb	S.Dak.	Texas	Wyo	California Bridge	California Hwy.	Idaho	Nev.	New Mex.	Ore.	Wash.
Base year	1940	1949	1949†	1940	'40-'41	'37-'41	1940	'49-'53	1940	'39-'40	1940	1950	1956	'38-'41	1940	1940
Year, quarter																
1940	100	....	....	100.0	100.0	93.2	100.0	....	100	99	100.0	....	....	101.2	100.0	100.0
1941	129	....	....	101.5	100.0	103.3	107.9	....	126	122	125.0	....	....	113.0	115.9	126.7
1942	181	....	....	145.1	125.5	171.4	159.8	....	178	158	157.5	....	....	169.1	156.8	174.5
1943	187	....	....	130.2	125.5	152.7	197.9	....	166	165	156.4	....	....	193.8	158.0	181.2
1944	199	....	....	131.8	125.5	157.0	138.5	....	203	153	177.8	....	....	144.0	166.4	177.7
1945	200	....	....	132.2	121.7	181.0	202.7	....	201	167	179.5	....	....	187.4	145.5	163.9
1946	205	....	....	147.1	149.6	162.4	177.6	....	186	197	179.7	....	....	180.1	155.9	163.0
1947	241	....	....	169.0	167.5	188.6	212.2	....	197	221	203.3	....	....	186.6	185.1	194.6
1948	249	....	100.9	195.6	191.6	222.3	230.5	....	200	229	216.6	....	....	178.7	198.6	200.4
1949	236	100.0	100.0	160.0	180.7	207.1	217.0	89.8	167	199	190.7	....	....	179.2	181.1	214.5
1950	**229**	**82.2**	**89.6**	**148.5**	**180.0**	191.3	**176.3**	97.3	**169**	....	**176.7**	**100.0**	....	210.5	....	....
Q1	....	....	....	....	....	....	177.8	87.8	....	177	160.6	....	....	....	157.6	....
Q2	....	....	....	H1 147.5	....	....	167.5	89.9	....	195	180.0	....	....	....	162.2	H1 168.6
Q3	....	....	....	....	....	....	179.5	101.6	....	212	189.2	....	....	....	175.8	....
Q4	....	....	....	H2 154.0	....	....	206.8	106.2	....	218	194.8	....	....	....	187.4	H2 169.8
1951	**279**	**87.7**	**104.1**	**185.3**	**192.4**	223.7	**229.4**	104.0	**209**	....	**210.8**	....	....	206.1	....	....
Q1	....	....	....	....	....	....	189.3	103.0	....	243	215.4	99.9	....	....	187.7	....
Q2	....	....	....	H1 180.5	....	....	254.6	108.6	....	250	238.3	114.6	....	....	193.6	H1 198.0
Q3	....	....	....	....	....	....	217.0	105.9	....	256	221.9	106.5	....	....	201.0	205.4
Q4	....	....	....	H2 197.8	....	....	268.0	97.9	....	253	245.4	119.9	....	....	196.6	209.8
1952	**313**	**101.5**	**112.6**	**203.0**	**187.3**	231.6	**212.6**	105.6	**238**	....	**224.5**	....	....	248.7	....	....
Q1	....	....	....	....	....	....	233.9	100.5	....	239	224.8	93.9	....	....	197.0	192.7
Q2	....	....	....	H1 207.1	....	....	216.6	104.7	....	236	224.4	94.2	....	....	199.5	204.3
Q3	....	....	....	....	....	....	204.0	109.4	....	239	221.2	93.8	....	....	205.4	211.4
Q4	....	....	....	H2 202.2	....	....	206.5	110.1	....	223	226.2	106.0	....	....	207.2	209.6
1953	**267**	**87.7**	**106.1**	**175.8**	**169.0**	223.8	**197.1**	102.7	**196**	....	**216.2**	....	....	246.9	....	....
Q1	....	....	....	....	....	....	227.1	110.0	....	243	218.3	104.9	....	....	176.3	199.8
Q2	....	....	....	H1 180.0	....	....	210.0	105.4	....	224	217.5	126.6	....	....	184.2	211.7
Q3	....	....	....	....	....	....	186.4	97.1	....	231	218.0	108.5	....	....	184.1	212.2
Q4	....	....	....	H2 170.7	....	....	206.8	98.4	....	235	216.7	116.9	....	....	183.4	209.6
1954	**210**	**82.8**	**95.5**	**174.9**	**162.4**	204.4	**168.6**	96.3	**175**	....	**193.5**	....	....	214.6	....	....
Q1	....	82.5	....	....	....	....	166.9	96.6	....	221	199.4	110.2	....	....	186.0	188.8
Q2	....	78.7	....	H1 172.2	....	....	169.5	98.8	....	217	189.0	107.5	....	....	167.2	190.0
Q3	....	86.0	....	....	....	....	168.6	95.6	....	220	207.8	92.8	....	....	160.1	190.6
Q4	....	85.4	....	H2 178.4	....	....	166.7	95.9	....	213	192.2	73.2	....	....	160.5	189.7
1955	**224**	**81.4**	**95.4**	**188.8**	**176.3**	212.2	**177.0**	97.0	**210**	....	**203.8**	....	**100.0**	**217.1**	....	....
Q1	....	76.4	....	....	157.3	....	154.9	94.7	....	217	189.3	104.6	....	....	156.1	173.0
Q2	....	81.4	....	H1 182.0	163.8*	....	172.8	99.0	....	237	212.4	110.1	....	....	170.0	183.0
Q3	....	92.3	....	....	170.7*	....	189.4	97.5	....	229.	208.6	120.0	....	....	155.2	187.0
Q4	....	82.8	....	H2 194.6	176.3*	....	189.8	98.6	....	237	212.6	118.6	....	....	158.0	186.0
1956	....	**92.8**	**99.8**	**211.4**	**214.6**	**241.1**	**198.8**	105.0	**245**	....	....	....	**118.2**	**258.7**	....	....
Q1	....	80.5	....	....	229.2*	....	189.6	100.6	....	245	219.5	124.0	....	....	186.6	190.0
Q2	H1 224	100.4	....	H1 207.8	215.8*	....	220.0	102.6	....	284	255.9	104.4	....	....	188.5	221.4
Q3	....	101.9	....	....	231.2*	....	212.0	107.4	....	260	249.1	113.0	....	....	198.6	223.7
Q4	....	88.5	....	H2 218.0	....	....	184.8	109.2	....	273	252.1	131.8	....	....	201.4	....
1957	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Q1	....	86.4	....	....	221.1*	....	189.0	107.4	....	292	277.7	95.9	105.5	....	187.7	231.4
Q2	....	105.4	H1 102.6	H1 209.3	192.0*	244.8	213.7	108.3	....	292	266.9	96.2#	130.4	....	202.0	232.1

* Cumulative average for year to date. † Computed by ENR. # July-August index average is 94.4. Q3 index is 280

Connecticut's semi-annual highway price indexes for five types of work and the composite index (chart below) are tabulated below.



Connecticut, Contract Price Index and Sub-Indexes (1939=100)

Date	Structures	Grading drainage	Trunk line
1939	100.00	100.00	100.00
1940	93.76	94.19	92.78
1945	138.65	175.00	160.97
1948	228.17	231.36	198.27
1949	196.49	184.51	171.42
Jun '50	174.09	182.77	166.05
Jun '51	235.69	234.30	179.83
Jun '52	267.63	249.80	191.92
Jun '53	239.88	232.88	194.06
Jun '54	243.38	228.84	195.22
Dec '54	244.96	230.03	198.27
Dec '55	255.72	244.01	207.82
Jun '56	289.62	294.43	239.53
Dec '56	323.74	317.54	245.31
Jun '57	327.46	319.46	245.88

	Concrete pavement	Town aid	Composite
1939	100.00	100.00	100.00
1940	98.54	86.41	93.93
1945	138.04	168.62	151.47
1948	198.31	190.28	211.81
1949	190.96	163.09	184.64
Jun '50	167.95	160.65	170.82
Jun '51	213.20	193.70	213.13
Jun '52	221.24	212.13	231.91
Jun '53	221.70	212.35	221.22
Jun '54	220.31	210.78	221.75
Dec '54	222.94	214.08	224.01
Dec '55	234.50	222.82	243.87
Jun '56	267.90	265.94	270.98
Dec '56	270.01	276.53	288.06
Jun '57	272.87	263.64	289.19

Middle Atlantic

The "Composite Mile" Highway Price Index of the New York State Department of Public Works is published in ENR for the first time. This quarterly index is based on average bid prices for the same six items which the U.S. Bureau of Public Roads uses in its U.S. Composite Mile Index.

Average bid prices are determined by all contracts let by the state and they are weighted by the same quantities as are used in the BPR index. The col-

(Continued on page 105)

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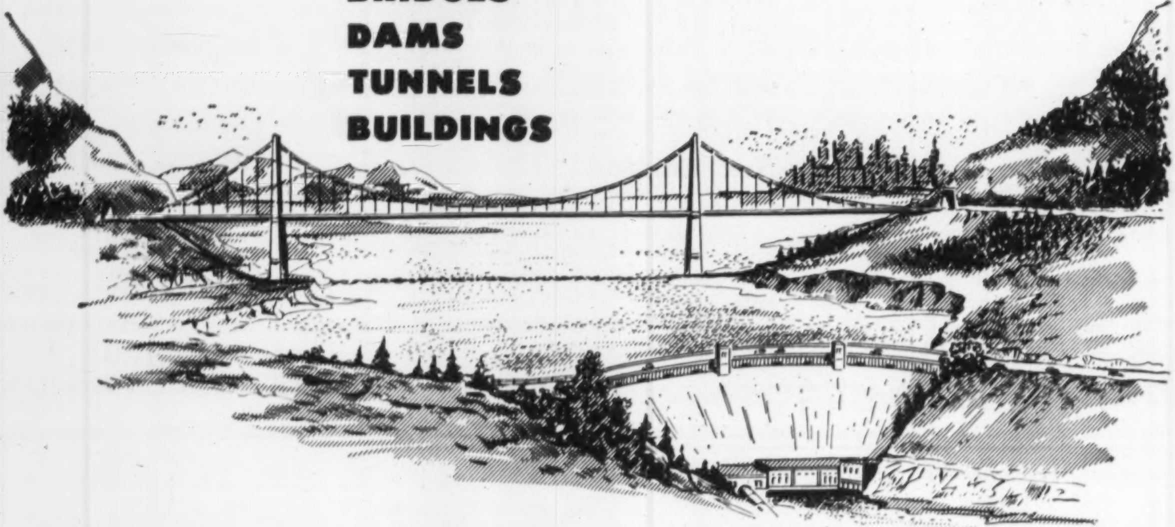

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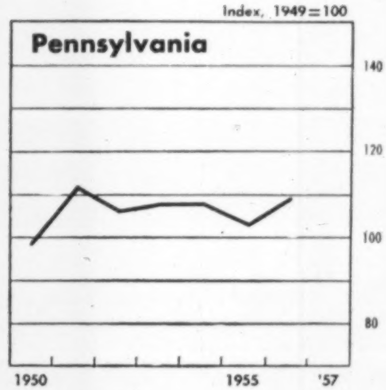
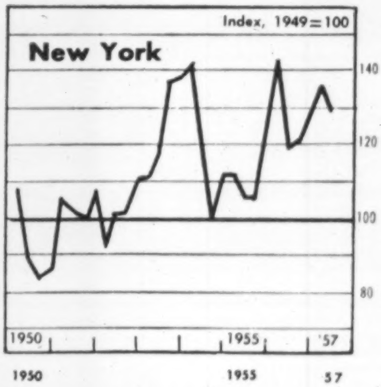




Middle Atlantic

(*Continued from page 103*)

umn, "Total Cost of Composite," is used for work-up purposes only and does not reflect the cost of the project.

The index shows rather sharp "ups" and "downs" within relatively short periods of time. For example, it fell from a record high of 287.4 (based on 1940 = 100) in the first quarter of 1956 down to 241.8 in the second quarter of that year. Similarly, it fell from its second highest point of 285.5 in the first quarter of 1954 to 200.1 in the third quarter of that year.

During the first six months of 1957, New York's index averaged about the same as during the corresponding months of 1956. Although neither the first or second quarter of the year was as high as 1956's first quarter peak, the second quarter '57 index of 261.7 is a record high for that time of the year.

After a 6% rise above '55, Pennsylvania's annual highway bid price index may have topped out in 1956 at 211. Based on 1940 = 100, weighted average unit prices in the first six months were below the first half of '56 for four of the eight items, though concrete and steel items averaged higher than a year earlier. Moreover, prices for five of the eight items so far this year average lower than in the last half of '56.

(*Continued on page 107*)

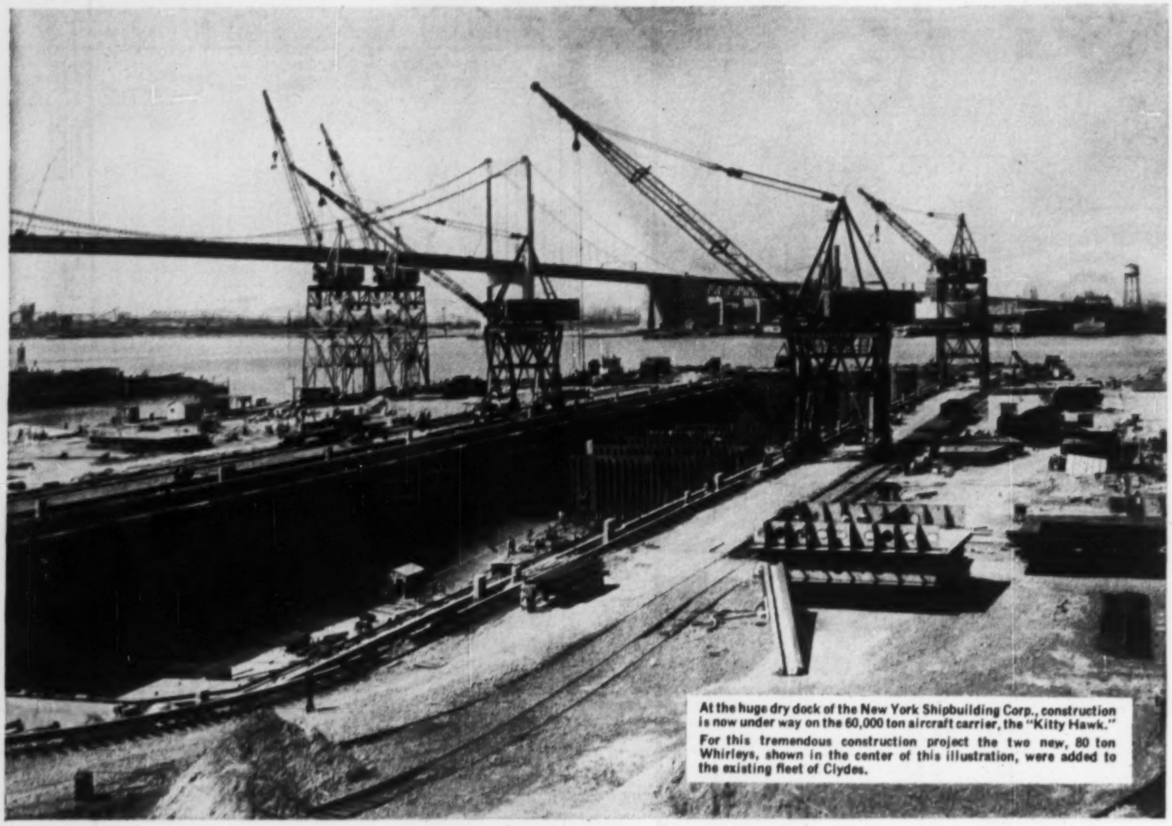
Pennsylvania, Weighted Average Unit Prices and Index

Year	Excavation Cl 1 $/cy	Excavation Cl 2 $/cy	Cr aggr base 8" $/sy	Bit surf DP-1 $/sy	RCC pvmt 9" $/sy	Concrete Cl A $/cy	Concrete Cl B $/cy	Reinf steel bars $/lb	Annual Index '40=100
1935	$0.494	$1.470	$0.736	$0.561	$2.729	$18.660	$15.167	$0.041	...
'39 H1	0.571	1.960	0.739	.....	2.740	20.43	15.68	0.046	...
H2	0.474	1.640	0.701	.....	2.430	20.96	17.68	0.047	...
'40 H1	0.449	1.779	0.799	0.734	2.586	22.151	18.059	0.044	
H2	0.417	1.680	0.808	0.695	2.515	22.522	17.601	0.045	100
'45 H1	1.436	2.850	1.409	.....	3.835	26.105	22.484	0.069	
H2	0.916	3.940	2.681	1.200	3.258	44.108	36.159	0.082	167
'46 H1	0.833	3.308	1.667	1.007	3.796	48.785	41.397	0.079	...
H2	0.948	3.844	1.752	1.284	3.995	44.397	37.776	0.074	171
'49 H1	0.965	4.042	1.986	1.241	4.985	75.156	45.747	0.113	...
H2	0.834	3.823	1.771	1.199	4.744	54.13	40.820	0.108	193
'50 H1	0.713	3.089	1.676	1.211	4.674	49.093	38.971	0.100	...
H2	0.819	3.675	1.742	1.100	4.971	55.208	41.90	0.106	192
'51 H1	0.921	4.049	1.867	1.500	6.154	61.092	49.547	0.127	...
H2	0.851	3.866	1.913	1.422	5.518	56.353	46.452	0.121	216
'52 H1	0.880	3.722	1.716	1.409	4.923	54.554	48.097	0.117	...
H2	0.912	4.017	1.902	1.277	5.150	62.451	48.891	0.125	205
'53 H1	0.787	4.048	1.930	1.176	5.138	58.440	46.728	0.123	...
H2	0.918	3.941	1.760	1.151	5.216	70.220	46.606	0.123	209
'54 H1	0.826	3.356	1.907	1.258	5.088	49.685	46.903	0.119	...
H2	1.059	2.749	1.419	1.240	5.175	52.092	34.680	0.116	208
'55 H1	0.604	2.664	1.764	0.950	5.333	48.868	43.488	0.114	...
H2	0.722	4.409	.....	1.016	5.254	56.127	44.305	0.118	199
'56 H1	0.904	4.243	1.861	1.500	5.715	53.208	41.998	0.122	...
H2	0.705	2.960	2.053	1.223	5.604	59.870	43.177	0.138	211
'57 H1	0.856	3.632	1.836	1.153	5.755	58.320	42.588	0.128	...

New York State "Composite Mile" Costs

1940 = 100

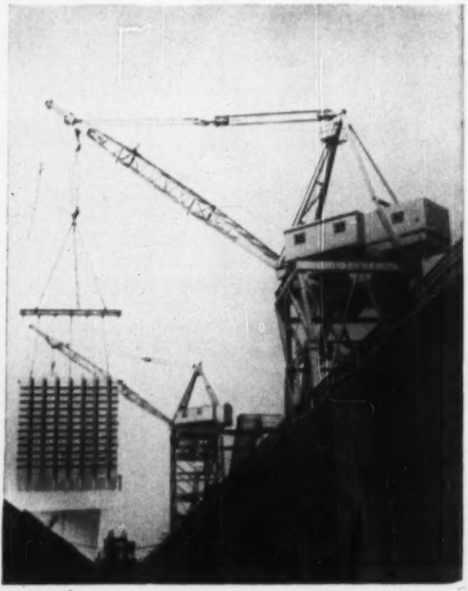
Year	Excavation, unclassified	Portland cement	Structural concrete	Steel bar reinf.	Structural steel	Cement concrete pavement	Total cost of composite	Index 1940=100
1940	....	....	.....	....	....	.....	$16,116	100.0
1941	....	....	.....	....	....	.....	18,555	115.1
1942	....	....	.....	....	....	.....	24,023	149.1
1943	....	....	.....	....	....	.....	27,295	169.4
1944	....	....	.....	....	....	.....	.....	.....
1945	$0.57	$2.83	$23.47	$0.077	$0.082	$7.63	24,503	152.0
1946	.60	2.71	33.30	.074	.116	8.29	26,230	162.8
1947:	**.659**	**3.20**	**39.96**	**.103**	**.127**	**10.31**	**30,842**	**191.4**
Q1	.57	3.03	34.48	.096	.11	9.85	......	.....
Q2	.71	3.15	36.84	.11	.21	10.78	......	.....
Q3	.64	3.28	41.01	.097	.11	10.64	......	.....
Q4	.68	3.24	41.45	.11	.13	10.23	......	.....
1948:	**.64**	**3.65**	**39.96**	**.12**	**.152**	**10.19**	**32,919**	**204.3**
Q1	....	....	.....	....	....	.....	......	.....
Q2	.612	3.46	36.57	.11	.17	9.72	......	.....
Q3	.61	3.66	41.79	.12	.158	10.07	......	.....
Q4	.73	3.73	41.57	.12	.148	10.56	......	.....
1949:	**.69**	**3.56**	**41.71**	**.125**	**.145**	**11.25**	**32,688**	**202.8**
Q1	.76	3.44	40.04	.132	.158	11.59	......	.....
Q2	.85	3.71	48.32	.133	.167	12.69	......	.....
Q3	.64	3.78	42.35	.11	.126	10.84	......	.....
Q4	.41	3.41	37.15	.118	.118	9.95	......	.....
1950:	**.515**	**3.56**	**39.71**	**.115**	**.154**	**9.36**	**28,265**	**175.4**
Q1	.97	3.35	35.80	.112	.116	9.99	35,101	217.8
Q2	.60	3.51	37.01	.121	.155	8.73	29,103	180.6
Q3	.41	3.62	42.46	.111	.153	10.01	27,249	169.1
Q4	.46	3.74	43.80	.113	.161	9.64	28,116	174.5
1951:	**.62**	**4.01**	**47.08**	**.13**	**.17**	**11.56**	**33,641**	**208.7**
Q1	.65	3.99	43.42	.128	.159	12.18	34,386	213.4
Q2	.62	4.02	46.50	.14	.19	11.09	33,426	207.4
Q3	.67	4.00	49.06	.13	.18	11.50	32,624	202.4
Q4	.59	4.06	56.44	.15	.18	12.48	35,049	217.5
1952:	**.595**	**4.09**	**47.68**	**.13**	**.18**	**11.60**	**33,445**	**207.5**
Q1	.474	3.90	52.02	.12	.21	10.28	30,079	186.6
Q2	.61	4.08	43.93	.13	.159	11.30	33,067	205.2
Q3	.56	4.13	52.49	.14	.19	11.32	33,162	205.8
Q4	.67	4.19	47.23	.13	.19	12.73	35,972	223.2
1953:	**.84**	**4.36**	**51.17**	**.13**	**.18**	**12.93**	**39,611**	**245.8**
Q1	.70	4.30	52.97	.13	.17	12.25	36,518	226.6
Q2	.76	4.31	50.36	.128	.18	13.62	38,262	237.4
Q3	1.00	4.66	58.04	.142	.19	14.13	44,680	277.2
Q4	1.18	4.27	55.83	.150	.17	11.49	44,993	279.2
1954:	**.80**	**4.32**	**49.17**	**.13**	**.17**	**12.98**	**38,719**	**240.6**
Q1	1.34	4.04	46.96	.12	.16	13.35	46,017	285.5
Q2	.89	4.40	47.99	.14	.18	12.28	37,868	235.0
Q3	.58	4.19	51.70	.14	.16	12.19	32,388	200.1
Q4	.70	4.54	49.12	.13	.16	14.26	36,634	227.3
1955:	**.55**	**4.43**	**47.95**	**.14**	**.16**	**13.05**	**34,610**	**214.8**
Q1	.57	4.32	45.09	.13	.11	15.61	36,609	227.1
Q2	.55	4.50	49.04	.13	.15	12.90	34,444	213.7
Q3	.54	4.29	47.61	.13	.15	12.69	34,303	212.8
Q4	.58	4.64	47.08	.15	.20	17.02	39,420	244.6
1956:	**.83**	**4.52**	**51.65**	**.15**	**.21**	**13.46**	**40,652**	**252.2**
Q1	.98	4.58	52.73	.16	.20	16.43	46,323	287.4
Q2	.78	4.40	52.34	.15	.21	12.73	38,965	241.8
Q3	.78	4.77	43.09	.14	.20	13.62	39,516	245.2
Q4	.83	4.58	53.38	.16	.22	14.34	41,883	259.9
1957:	....	....	.....	..	....	.....	......	.....
Q1	.91	4.98	57.24	.15	.18	14.62	44,072	273.4
Q2	.82	4.35	68.13	.13	.20	14.75	42,182	261.7



At the huge dry dock of the New York Shipbuilding Corp., construction is now under way on the 60,000 ton aircraft carrier, the "Kitty Hawk."

For this tremendous construction project the two new, 80 ton Whirleys, shown in the center of this illustration, were added to the existing fleet of Clydes.

$120,000,000 construction project uses five Clyde Whirleys



With a four acre flight deck one-fifth of a mile long and an overall height equal to a twenty-five story building, this $120,000,000 construction project requires a tremendous amount of material handling know-how. Placing 52,000 tons of structural steel, 1,000 tons of aluminum, 180 miles of piping, 290 miles of cable . . . keeping materials moving on schedule . . . this is the assignment handed the five Clyde Whirleys by New York Ship.

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BUILDERS TOWERS : CAR PULLERS : ROLLERS

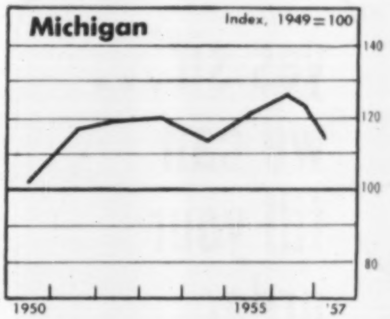
Middle West and South

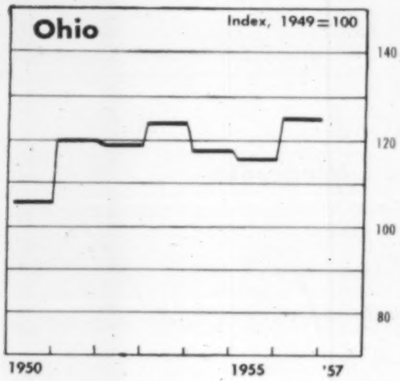
(*Continued from page 105*)

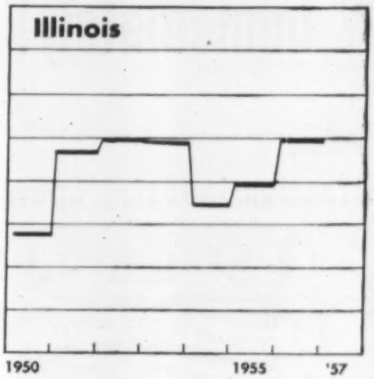
The Illinois State Highway Department's Annual Composite Prices Index, published in ENR for the first time covers 38 years from 1919 to 1956. This is the longest time period covered by any of the highway price indexes reported to ENR.

Rising prices in 1956 ended a three-year decline in this index and pushed it to 195, based on 1937-41 = 100.

(*Continued on page 108*)







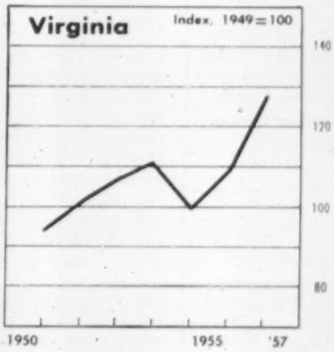
Illinois Price Index

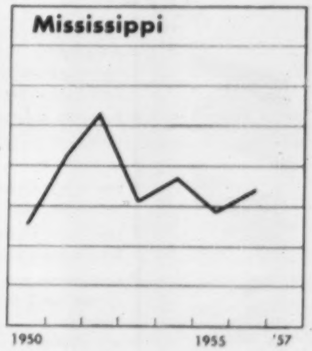
1937-41 = 100

Year	Grading (14%)	Surfacing (58%)	Structures (28%)	Composite Index 1937-41 = 100
1919	186	117	124	129
1920	223	139	165	158
1921	110	125	99	116
1922	85	110	91	101
1923	113	119	112	116
1924	127	121	104	117
1925	105	120	97	111
1926	110	116	92	108
1927	115	115	98	110
1928	106	110	95	105
1929	103	106	87	100
1930	98	95	81	92
1931	73	77	68	74
1932	63	75	57	68
1933	75	87	69	80
1934	102	92	74	88
1935	135	96	85	98
1936	134	114	116	117
1937	107	111	105	109
1938	101	94	92	94
1939	108	104	92	101
1940	93	91	89	91
1941	91	101	121	106
1942	157	125	143	135
1943	159	119	146	132
1944	163	111	167	134
1945	179	112	167	137
1946	193	122	159	142
1947	176	130	190	153
1948	163	151	255	182
1949	141	139	219	162
1950	155	137	202	158
1951	169	145	292	189
1952	190	152	287	195
1953	176	151	284	192
1954	182	150	267	187
1955	148	143	268	179
1956	163	145	313	195

Virginia Prices, Price Index— 1937-41 = 100

Year	Excavation $/cy	Excavation Sub-Index	Surfacing $/sy	Surfacing Sub-Index	Structures Reinf. Steel $/lb	Structures Struct. Conc. $/cy	Sub-Index	Composite Mile Index
1937-41	$0.282	100.0	$1.012	100.0	$0.0494	$22.13	100.0	100.0
1939	0.25	88.7	1.02	100.8	0.0460	22.40	99.5	96.1
1940	0.25	88.7	1.04	102.8	0.0468	21.05	95.0	95.8
1945	0.55	195.0	1.53	151.2	0.0700	45.93	193.5	176.9
1946	0.53	187.9	2.05	202.6	0.0790	49.36	209.6	198.9
1947	0.55	195.0	2.00	197.6	0.0940	54.39	233.9	205.1
1948	0.67	237.6	2.26	223.3	0.1110	56.58	249.1	234.5
1949	0.55	195.0	2.01	198.6	0.1040	50.92	225.9	203.6
1950	0.55	195.0	1.66	164.0	0.1051	52.30	231.3	190.8
1951	0.71	251.8	2.00	197.6	0.1400	74.88	326.8	247.1
1952	0.77	273.0	2.00	197.6	0.1457	78.52	342.0	258.4
1953	0.61	216.3	2.01	198.6	0.1279	66.07	290.1	228.2
1954	0.48	170.2	2.00	197.6	0.1229	60.39	267.7	203.8
1955	0.60	212.8	2.14	211.5	0.1229	58.56	261.2	223.4
1956	0.79	280.1	2.16	213.4	0.1500	70.59	315.7	261.3





Mississippi, Average Unit Prices and Index—'37-'41 = 100

	Grading		Drainage	Cement concrete pavement				Bit pavement		Gravel		Structures						
Year	Exc, uncl [a] $/cy	Topping [a] $/cy	B conc culv [b] $/cy	Plain cmt $/sy	7-5-7" RCC $/sy	8-6-8" RCC $/sy	9-6-9" RCC $/sy	Asph. prime $/gal	Cover mtls $/cy	Surf course $/cy	Stab aggr $/cy	Conc, B&C bri $/cy	Reinf stl, bri $/lb	Str stl $/lb	Timber treated $/Mbm	Piling timb [f] $/lf	Piling stl $/lf	Composite index '37-'41 = 100
1940	0.212	0.42	20.48	1.34	1.51	1.76	1.68	0.094	4.55	2.18	1.56	23.36	0.04	0.05	124.88	1.04	....	100.36
1941	0.250	0.42	25.61	1.71	2.20	2.58	2.50	0.072	....	1.91	0.81	27.98	0.05	0.06	139.30	1.25	....	117.07
1942	0.398	0.41	32.60	2.62	2.32	2.73	2.65	0.17	....	3.00	....	34.27	0.067	0.09	249.73	1.88	....	158.79
1943	0.267	1.26	27.98	3.25	2.44	2.88	2.81	0.179	6.00	....	....	30.35	0.06	0.094	176.00	1.54	....	173.68
1944	0.567	1.07	32.58	2.44	2.55	3.04	2.97	0.125	5.50	2.43	....	33.17	0.143	0.098	200.00	2.29	....	196.10
1945	0.671	1.21	38.66	2.58	2.95	3.47	3.36	....	....	4.00	....	60.00	0.09	0.10	205.55	2.31	....	234.88
1946	0.311	0.62	42.46	2.72	2.28	2.38	2.49	0.11	5.25	2.85	4.25	41.22	0.07	0.085	211.11	2.34	3.21	163.42
1947	0.345	0.72	47.80	3.96	2.26	3.00	3.17	0.139	6.55	2.55	4.43	49.96	0.09	0.112	237.50	2.37	3.93	187.91
1948	0.325	0.79	48.41	3.80	2.78	2.82	2.95	0.17	7.03	3.08	4.41	54.66	0.11	0.127	276.04	2.63	3.71	197.10
1949	0.312	0.71	45.852	3.64	2.99	3.269	3.291	0.155	7.076	2.337	2.218	46.534	0.102	0.114	232.91	2.133	2.735	182.69
1950	0.260	0.797	42.16	3.50	2.78	4.00	2.57	0.165	6.72	2.385	3.86	43.945	0.098	0.119	222.12	1.98	3.319	175.48
1951[c]	0.320	0.78	52.87	....	3.90	....	3.39	0.17	6.77	2.70	3.74	55.07	0.123	0.144	275.26	2.27	4.10	206.49
1952	0.410	0.82	50.43	....	3.83[d]	....	....	0.17	6.85	2.13	3.99	59.00	0.123	0.156	277.78	2.25	5.44	227.35
1953	0.286	0.73	50.58	....	3.25[d]	....	2.74[e]	0.156	6.16	2.94	4.09	48.80	0.11	0.134	253.31	1.90	3.98	186.75
1954	0.307	0.84	47.72	....	2.79[d,e]	3.61[d,e]	3.18[d,e]	0.162	6.59	2.66	4.40	49.23	0.12	0.13	290.24	1.95	3.91	195.00
1955*	0.276	0.76	45.14	....	2.13[d,e]	2.50[d,e]	2.42[d,e]	0.157	6.43	2.90	3.19	47.25	0.115	0.12	255.75	2.02	3.66	180.67
1956	0.271	0.78	44.49	....	2.54	2.99	2.89	0.156	6.43	2.68	3.17	53.61	0.123	0.17	278.28	2.03	4.29	188.96
Base prices	34.8%		8.2%	20.2%				9.6%		4.1%		23.1%						
'37-'41	0.235	0.346	20.53	1.64	1.48	none	1.60	0.094	4.56	1.98	1.67	23.04	0.043	0.052	121.27	1.19	1.80	100.00
Sub wgt %	64.1	35.9	8.2	0.3	34.8	1.6	63.3	50.3	49.7	32.1	67.9	44.9	12.4	27.1	1.5	6.6	7.5	

* First half of 1955. No contracts (emergencies excepted) let last six (6) months of commissioner's term of office. Mississippi Laws of 1948 [a] incl haul [b] incl D conc [c] first half of yr only [d] convrtd from 6" uniform [e] convrtd from 3" uniform [f] creo

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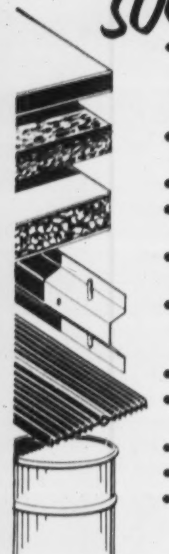

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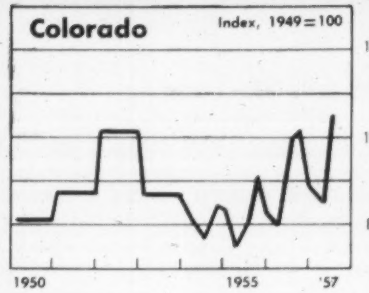

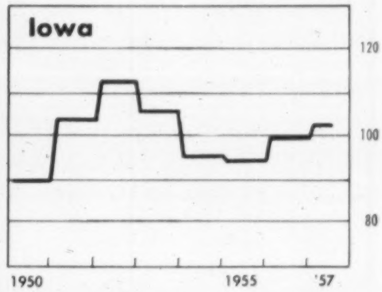

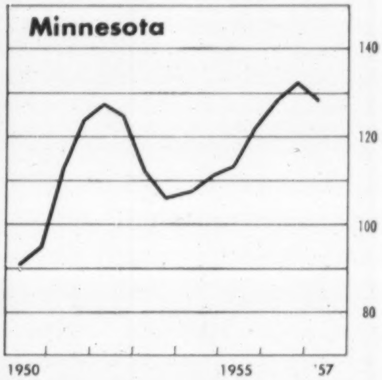

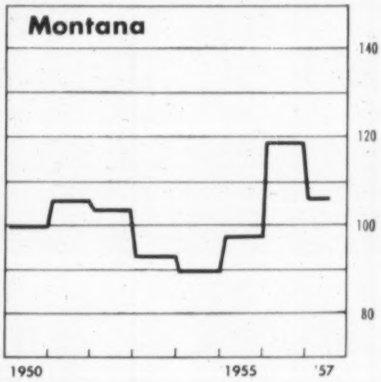

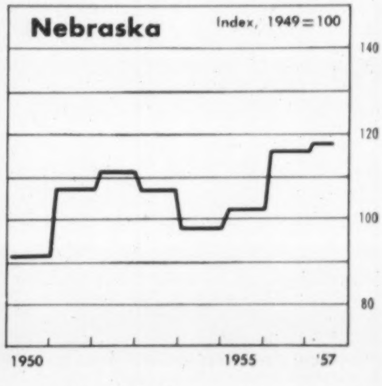

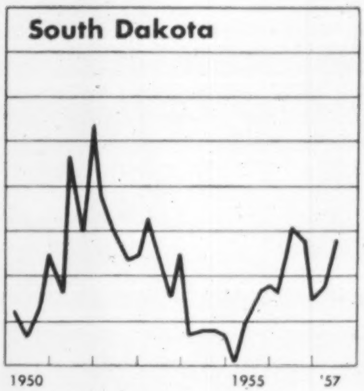

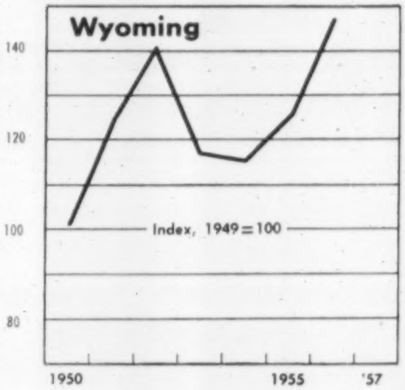

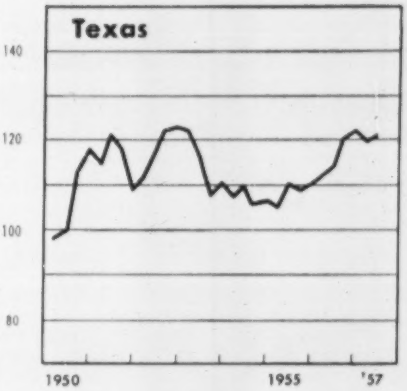

West of the Mississippi

(Continued from page 107)

The Kansas State Highway Commission computes composite mile price indexes for five types of road work and two typical bridges—one of concrete, 140 ft long, and one of steel, 204 ft in length. The indexes are based on average unit bid prices for all projects let.

(Continued on page 111)

Colorado, Unit Prices Used in Contract Price Index

Item	Unit	Quantity	Unit Price 1949	1954	1955	1956	2nd Q 1957
Excavation, unclass.	cy	10,630	$0.441	$0.277	$0.261	$0.337	$0.358
struct	cy	109	3.376	2.045	**	**	**
Backfill, struct	cy	116	1.948	1.443	**	**	**
Rolling	hr	88	7.470	8.843	**	**	**
Wetting	Mgal	351	1.382	1.123	**	**	**
Overhaul	stay	64,112	0.014	0.008	0.007	0.009	0.008
	ydmi	6,055	0.122	0.099	0.102	0.094	0.096
	tnmi	12,188	0.091	0.073	0.071	0.073	0.079
Sub-base	t	2,998*	0.521	0.376	0.343	0.364	0.572
Gravel, cr rock surf	t	1,976	0.894	0.746	0.766	0.893	1.043
Asphalt	t	17	37.500	26.236	**	**	**
liquid	gal	10,252	0.151	0.148	0.159	0.176	0.220
Road mix process	sy	4,659	0.097	0.082	**	**	**
Stone screenings	t	70	3.727	5.106	**	**	**
Asph surf, plant mix	t	279	4.500	3.315	3.163	3.130	3.379
Concrete pavement	sy	449	3.512	3.858	3.646	3.502	5.021
Bridge timber	Mfbm	1	236.378	263.387	**	**	**
Concrete	cy	36	48.564	48.721	51.251	50.116	57.004
Steel, reinf	lb	4,107	0.115	0.111	**	**	**
struct	lb	7,114	0.133	0.142	0.145	0.188	0.203
Culvert, RCCP	lf	16#	8.263	6.303	**	**	**
CMP	lf	109#	5.823	7.366	6.955	8.724	8.072
Fence, barbed wire	lf	1,286	0.220	0.222	**	**	**
Sewer pipe	lf	17#	7.504	7.498	**	**	**

* incl all matl whether bid as sub-base or select borrow # incl all diam priced at average of all pipe used † estimated ** Item not included in index beginning with 3rd quarter '55

Nebraska Contract Unit Price Index (1939-41=100)

Year (Weight)	Excavation (18%) $/cu. yd.	Culvert concrete (5%) $/cu. yd.	24" Culvert pipe (2%) $/lin. ft.	Class "A" gravel surface (20%) $/cu.yd.	PCC pavement (15%) $/sq.yd.	Asphaltic oil (15%) $/gal.	Bridge concrete (9%) $/cu. yd.	Structural steel (16%) $/lb.	Composite Index 1937-41 =100
1937	0.157	15.80	2.01	1.09	1.93	.081	19.51	.055	**106.2**
1938	0.135	14.56	1.78	1.06	1.91	.070	19.02	.054	**99.1**
1939	0.123	15.08	1.85	0.86	1.92	.079	18.89	.061	**97.5**
1940	0.097	13.49	1.92	1.02	2.08	.077	17.64	.049	**93.2**
1941	0.133	15.41	1.87	0.99	2.14	.076	20.08	.061	**103.3**
1942	0.314	29.38	....	1.46	2.80	.088	30.00	....	**171.4**
1943	0.197	27.15	....	1.81	2.36	.096	31.40	.088	**152.7**
1944	0.228	29.76	....	1.84	2.61	.089	34.80	.076	**157.0**
1945	0.237	34.64	3.25	2.05	3.40	.102	39.33	.098	**181.0**
1946	0.184	35.95	2.78	1.80	2.60	.099	42.64	.094	**162.4**
1947	0.203	39.67	3.23	2.03	3.03	.126	43.92	.123	**188.6**
1948	0.222	47.25	3.66	2.17	4.00	.159	50.00	.153	**222.3**
1949	0.202	43.53	4.15	1.97	3.53	.142	54.03	.144	**207.1**
1950	0.179	41.25	4.24	1.78	3.28	.140	49.47	.130	**191.3**
1951	0.190	46.99	4.74	2.21	3.99	.145	54.83	.169	**223.7**
1952	0.204	45.79	4.91	2.25	3.85	.154	56.68	.182	**231.6**
1953	0.186	46.39	4.96	2.13	4.39	.145	48.64	.176	**223.8**
1954	0.173	41.97	4.33	2.10	3.54	.139	49.01	.150	**204.4**
1955	0.168	45.95	4.68	2.08	3.59	.143	51.92	.166	**212.2**
1956	0.187	44.76	5.05	2.21	3.57	.155	58.06	.231	**241.1**
1957 (6 Mos.)	0.210	44.07	5.24	2.24	3.31	.163	52.59	.241	**244.8**

Kansas, Highway Cost Indexes (1940=100)

Year	Grading, culverts	Concrete pavement	Aggr. base course	Bit. constr types	Light type surfacing	Bridges Concrete	Steel
1940	100	100	100	100	100	100	100
1946	168	134	153	152	129	212	142
1950	159	193	117	158	113	282	262
1951	182	226	192	185	149	353	341
1952	217	237	203	231	166	368	347
1953	191	245	142	219	163	371	330
1954 H1	168	232	133	201	144	336	308
H2	175	235	130	202	144	336	298
1955 H1	204	240	169	204	150	339	309
H2	199	242	169	205	153	348	320
1956 H1	217	261	164	201	139	345	333
H2	188	249	159	198	122	338	336
1957 H1	203	224	157	167	112	348	354

South Dakota, Average Unit Prices and Price Index (1940=100)

	Roadway excav. $/cy	Cr. grav. Surf. $/t	Liq. asph. $/gal	Plt. mix bit. surf. $/t	Conc. Cl A $/cy	Reinf. steel $/lb	Struct. steel $/lb	Composite Index '40=100
1940	$0.120	$0.59	$0.078	$1.49	$19.11	$0.044	$0.050	**100.0**
1945	0.270	1.21	0.106	.....	38.69	0.078	0.096	**202.7**
1946	0.214	1.13	0.101	2.91	38.49	0.085	0.095	**177.6**
1949	0.197	1.40	0.159	3.83	54.01	0.125	0.135	**217.0**
'54 Q 1	0.157	1.03	0.120	2.37	46.15	0.110	0.168	**166.9**
2	0.163	0.94	0.126	2.34	49.62	0.118	0.155	**169.5**
3	0.164	0.93	0.120	2.24	51.75	0.127	0.133	**168.6**
4	0.189	0.91	0.113	2.16	49.62	0.121	0.135	**166.7**
'54	**0.171**	**0.95**	**0.121**	**2.26**	**49.23**	**0.119**	**0.148**	**168.6**
'55 Q 1	0.162	0.80	0.120	2.01	49.33	0.109	0.146	**154.9**
2	0.176	0.95	0.129	2.52	47.79	0.119	0.169	**172.8**
3	0.187	1.13	0.136	2.72	49.79	0.126	0.162	**189.4**
4	0.175	1.44	0.127	2.79	48.00	0.130	.....	**189.8**
'55	**0.179**	**1.01**	**0.129**	**2.48**	**49.09**	**0.122**	**0.163**	**177.0**
'56 Q 1	0.187	1.07	0.134	3.03	53.12	0.133	0.165	**189.6**
2	0.261	1.05	0.111	3.40	56.62	0.134	0.607	**220.0**
3	0.212	1.44	0.141	3.12	50.27	0.136	0.185	**212.0**
4	0.175	1.04	0.094	3.85	58.38	0.143	0.183	**184.8**
'56	**0.208**	**1.16**	**0.124**	**3.27**	**52.79**	**0.136**	**0.176**	**198.8**
'57 Q 1	0.171	0.95	0.167	2.72	51.87	0.131	0.174	**189.0**
2	0.253	1.02	0.160	3.01	49.21	0.139	0.194	**213.7**
3	0.208	1.26	0.110	3.71	47.22	0.124	0.172	**200.0**

Wyoming, Average Unit Prices and Index

Weight Year	Excav common 39% $/cy	Grav base* 29% $/cy	Oil 9% c/gal	Conc Cl A 11% $/cy	Struct steel 6% $/lb	Timber treated piling 6% $/lf	Comp. Index 40=100
1940	$0.125	$0.670	$0.067	$18.15	$0.067	$1.25	**100**
1945	0.331	1.204	0.087	30.72	0.102	1.250	**201**
1948	0.250	1.263	0.093	33.61	0.108	2.105	**186**
1949	0.199	0.780	0.124	48.00	0.145	2.512	**167**
1950	0.218	0.743	0.104	51.90	0.147	2.351	**169**
1951	0.281	0.945	0.125	52.53	0.203	2.724	**209**
1952	0.344	0.907	0.126	68.00	0.193	3.150	**236**
1953	0.254	0.827	0.128	50.80	0.196	3.084	**196**
1954	0.226	0.777	0.109	51.93	0.128	2.731	**175**
1955	0.243	1.152†	0.096#	62.446	0.177	3.545	**210**
1956	0.293	1.404	0.120	65.014	0.251	3.182	**246**

* surfacing and haul †Crushed Gravel Base Course (1" Max), type most used #Asphaltic Material AC (85-100), type most used

Pouring crews can work until late afternoon without involving finishing overtime.

Columbia Calcium Chloride in the concrete accelerates the set, lets finishers do their work within regular hours. Concrete results are better; forms can be removed sooner.

CONCRETE THE MODERN WAY

STRONGER, FASTER IN FALL AND WINTER

with COLUMBIA CALCIUM CHLORIDE

The American Concrete Institute now recommends the addition of calcium chloride for cold weather concreting. (ACI Standard "Recommended Practice for Winter Concreting".)

Anytime the temperature drops below 70°F, calcium chloride prevents lag in the set of concrete and assures you high early and ultimate strength.

The addition of Columbia Calcium Chloride is easy and economical. It may be added to the mix either at the plant or on the job site. Columbia Calcium Chloride is available in two grades: High Test Flake (94-97% $CaCl$) in 80 lb. bags and Regular Flake (77-80% $CaCl$) in 25 lb. and 100 lb. bags.

Columbia
CALCIUM CHLORIDE

The dividends for your wisdom in using Columbia Calcium Chloride are outstanding: concrete sets faster, has quicker early strength and greater ultimate strength, forms are released faster, production schedules are accelerated, your profit on the job is increased.

Let our Columbia Calcium Chloride engineers help you save money on your fall and winter concreting. For their assistance, write today to Calcium Chloride Department at our Pittsburgh address, or at any of our fourteen District Sales Offices.

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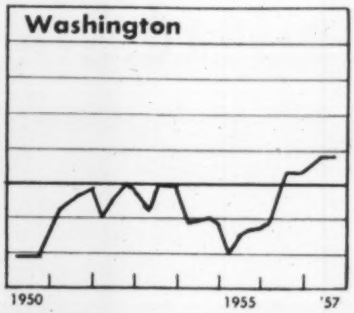
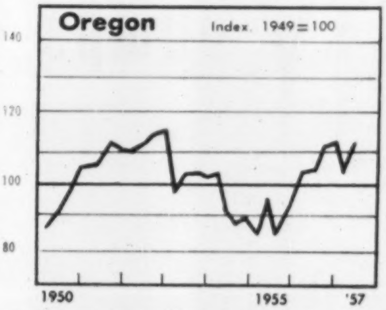
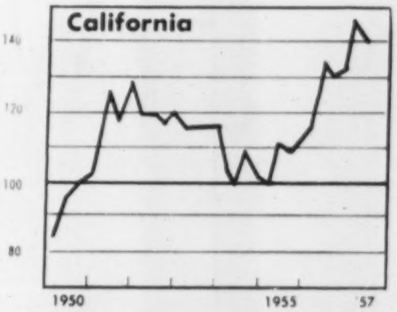
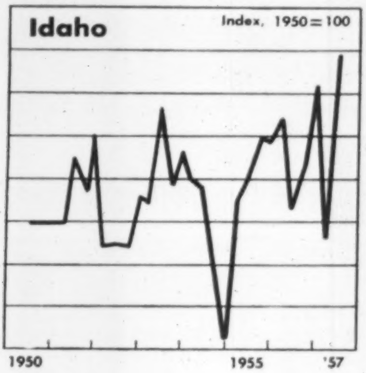
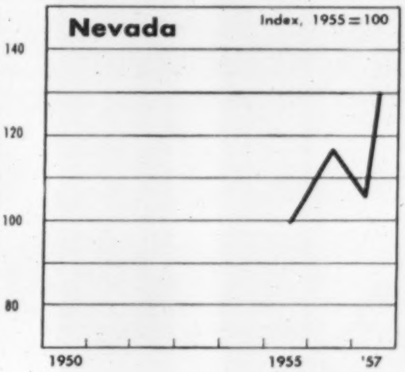
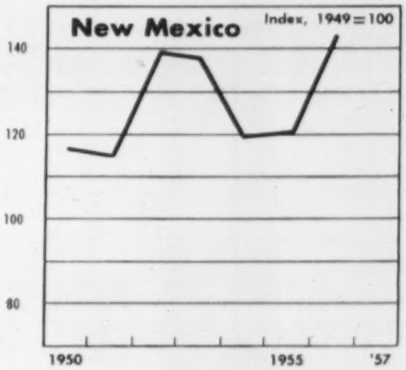












Far West

(*Continued from page* 109)

The Nevada Department of Highways computes average bid prices and a composite price index, which is shown in ENR for the first time (see table below). The index and unit prices begin in 1955.

Nevada, Average Unit Prices And Composite Index, 1955 = 100

Year	Roadway excavation $/cy	Borrow $/cy	Type 1 Gravel $/cy	Type 2 Gravel $/cy	Liquid asphalts $/ton	Plantmix surface $/ton
1955	0.388	0.219	0.660	0.869	31.97	2.64
1956	0.506	0.300	0.845	0.893	39.86	2.48
1957 Q1	0.374	0.211	0.685	0.833	38.30	2.70
Q2	0.599	0.240	0.806	0.962	39.60	3.12

Year	Class AA concrete $/cy	Reinf steel $/lb	24" Corr. metal pipe $/lf	24" Reinf conc pipe $/lf	Composite Index 1955 = 100
1955	61.17	0.120	5.55	6.86	**100.0**
1956	78.98	0.144	6.08	7.00	**118.2**
1957 Q1	80.72	0.132	6.82	6.47	**105.5**
Q2	95.87	0.152	6.65	7.29	**130.4**

Idaho, Av. Contract Unit Prices and Index

Year	Excav uncl $/cy	Sprinkling $/Mgal	Rolling $/hr	Crush surf $/t	Asph all gr $/gal	Road-Mix $/mi	Plant Mix $/t	Conc. Cl A $/cy	Reinf. steel $/lb	Comp. Index '50 = 100
'50	$0.618	$1.11	$4.06	$0.95	$0.129	$2,592.42	$1.92	$54.17	$0.112	**100.00**
53 Q 1	0.506	1.22	4.22	1.00	0.144	2,977.37	4.56	64.71	0.134	**104.9**
Q 2	0.574	1.70	5.00	1.26	0.147	4,214.41	....	69.73	0.152	**126.6**
Q 3	0.410	1.31	3.85	0.90	0.160	2,985.71	3.45	63.41	0.136	**108.5**
Q 4	0.553	1.16	3.76	1.17	0.189	3,835.49	3.80	61.39	0.126	**118.9**
'54 Q 1	0.448	0.57	3.83	0.80	0.154	1,340.60	3.92	51.17	0.146	**110.2**
Q 2	0.426	1.31	4.86	1.26	0.124	2,047.42	2.91	58.97	0.111	**107.5**
Q 3	0.296	0.96	4.15	0.96	0.150	3,192.20	2.84	59.90	0.119	**92.8**
Q 4	0.342	0.54	3.31	0.64	0.135	2,166.80	2.00	56.45	0.122	**73.2**
'55 Q 1	1.333	1.33	4.76	0.932	0.163	2,686.12	3.85	62.25	0.1413	**104.6**
Q 2	0.612	0.955	4.57	0.989	0.156	3,309.92	3.47	63.67	0.14	**110.1**
Q 3	0.601	1.19	5.92	0.886	0.159	3,420.96	4.07	58.97	0.1204	**120.0**
Q 4	0.55	1.26	5.69	1.45	0.168	2,856.06	2.47	55.97	0.126	**118.6**
'56 Q 1	0.85	1.32	6.18	1.08	0.20	*7,859.00	....	60.54	0.123	**124.0**
Q 2	0.44	1.42	3.81	1.07	0.158	2,983.20	3.36	70.70	0.138	**104.4**
Q 3	0.477	0.88	5.33	1.164	0.183	3,232.00	*12.00	83.79	0.151	**113.0**
Q 4	0.684	1.25	7.53	1.478	0.156	*5,263.00	4.16	74.21	0.153	**131.8**
'57 Q 1	0.403	1.43	1.44	1.265	0.183	*3,810.70	3.83	77.88	0.1524	**95.9**
Q 2	0.496	1.45	5.80	1.43	0.189	*2,211.00	2.995	82.00	0.153	**96.2**
Q 3	0.615	1.43	5.585	1.385	0.192	....	5.625	79.47	0.155	**94.4**

* Not used, distorted account, small quantity and not average condition # July-August only

Oregon, Composite and Sub-Indexes—1940 = 100

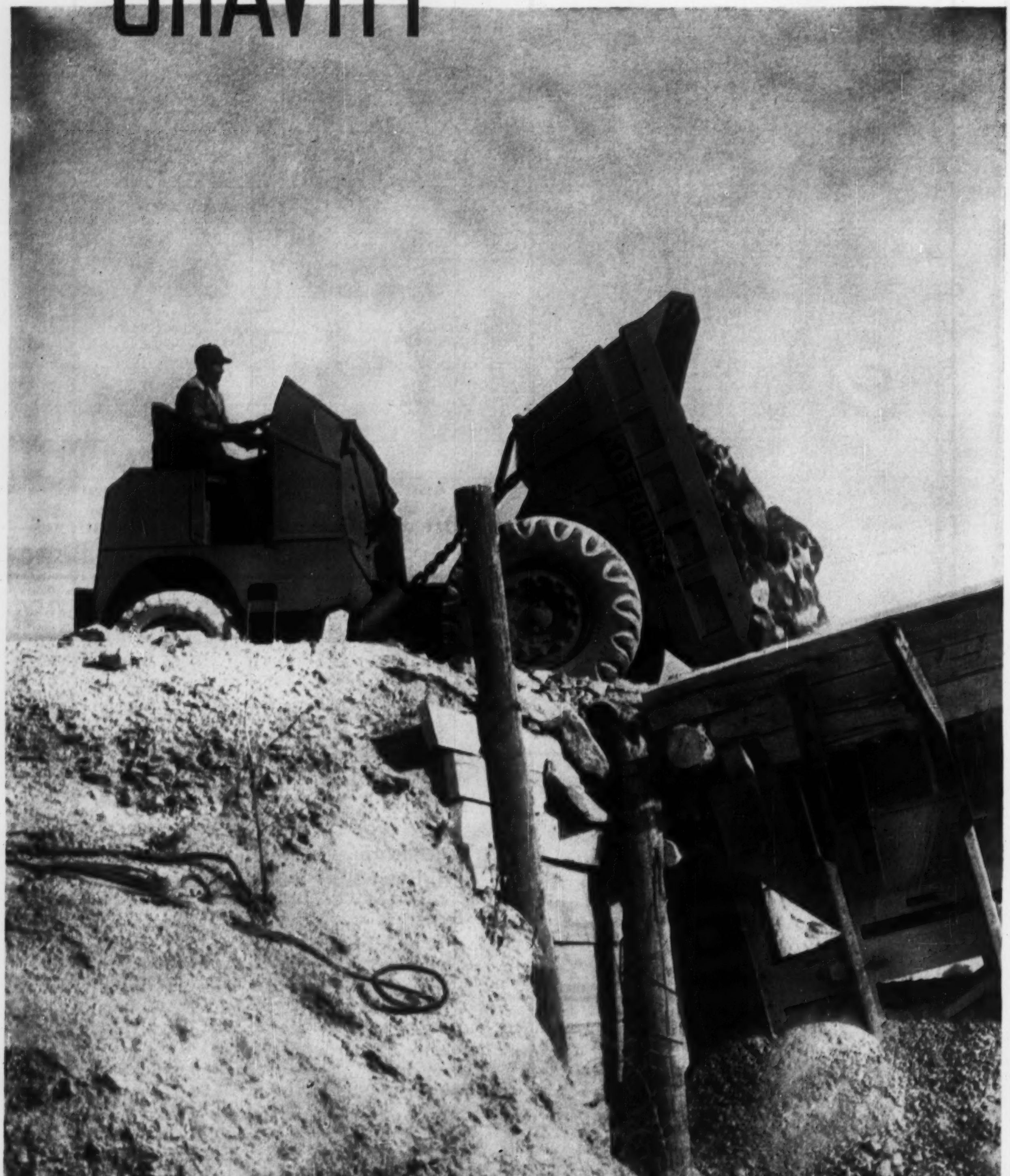
Year	Grading	Cr rock surface	Bit mac surface	Asph conc pavement	Port cmt conc pave	Conc bridge & structs	Composite index
1940	100.0	100.0	100.0	100.0	100.0	100.0	**100.0**
'53 Q 1	187.4	160.6	186.3	115.5	221.5	247.6	**176.3**
Q 2	170.8	179.1	181.9	119.9	236.1	281.4	**184.2**
Q 3	173.4	184.7	184.9	116.3	234.2	266.9	**184.1**
Q 4	162.0	191.0	179.7	113.7	237.3	271.7	**183.4**
'54 Q 1	163.5	191.2	182.3	121.1	239.2	275.9	**186.0**
Q 2	158.7	146.2	170.1	119.5	239.0	264.4	**167.2**
Q 3	156.2	159.0	162.8	101.0	241.1	240.8	**160.1**
Q 4	150.2	142.6	165.0	100.8	240.5	264.5	**160.5**
'55 Q 1	146.0	123.4	176.3	102.6	240.8	269.1	**156.1**
Q 2	154.9	152.6	183.8	118.8	241.3	267.2	**170.0**
Q 3	162.7	118.1	151.5	102.4	241.1	285.3	**155.2**
Q 4	160.5	141.0	174.6	119.5	244.2	272.2	**166.0**
'56 Q 1	170.8	187.9	176.2	112.6	250.0	291.9	**186.6**
Q 2	206.6	155.0	185.3	122.7	253.2	305.3	**188.5**
Q 3	217.7	179.1	189.1	123.3	259.5	303.4	**198.6**
Q 4	210.3	173.5	206.0	125.2	259.5	322.3	**201.4**
'57 Q 1	217.7	145.4	188.4	119.9	259.5	304.5	**187.7**
Q 2	228.8	180.3	190.8	128.7	259.5	301.3	**202.0**

California, Average Highway Prices, Highway and Bridge Price Indexes

Year	Rdwy excav $/cy	Crush run base $/t	Plant mix surf $/t	Asph conc pave $/t	PCC pave-ment $/cy	PCC struc-tures $/cy	Bar reinf steel $/lb	Struc-tural steel $/lb	Price Indexes Hwy const '40 = 100	Bridge const '39-'40 = 100
1940	$0.22	$1.54	$2.19	$2.97	$7.68	$18.33	$0.040	$0.083	**100.0**	**99**
1946	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099	**179.7**	**197†**
1949	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117	**190.7**	**199†**
'53 Q 1	0.45	2.48*	5.27	4.46	12.47	53.19	0.098	0.150	**218.3**	**243**
2	0.50	2.07	5.38	4.59	13.06	52.68	0.091	0.132	**217.5**	**224**
3	0.54	2.15	5.30	4.82	13.78	49.23	0.092	0.129	**218.0**	**231**
4	0.48	2.11	4.74	4.47	14.77	53.41	0.105	0.139	**216.7**	**235**
'54 Q 1	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126	**199.4**	**221**
2	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114	**189.0**	**217**
3	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.167	**207.8**	**220**
4	0.35	1.78	4.83	.....	13.13	46.08	0.094	0.135	**192.2**	**213**
'55 Q 1	0.39	1.69	4.55	.....	13.44	40.66	0.095	0.140	**189.3**	**217**
2	0.42	1.99	5.39	.....	14.46	51.36	0.098	0.136	**212.4**	**237**
3	0.41	2.33	5.43	5.70	13.46	49.64	0.093	0.132	**206.6**	**229**
4	0.37	2.00	5.52	4.00	15.05	52.72	0.099	0.144	**212.6**	**237**
'56 Q 1	0.40	2.08	5.40	6.50	14.05	52.51	0.105	0.166	**219.5**	**245**
2	0.51	2.06	6.27	.....	14.64	57.13	0.113	0.219	**255.9**	**284**
3	0.52	2.27	6.12	.....	15.57	56.32	0.121	0.178	**249.1**	**280**
4	0.52	2.21	**	5.93#	14.95	59.63	0.112	0.197	**252.1**	**273**
'57 Q 1	0.63	2.10	**	5.94#	17.28	61.14	0.129	0.235	**277.7**	**292**
2	0.63	2.10	**	6.18#	15.59	58.61	0.119	0.204	**286.9**	**292**
3	.....	.....	**	.....	.....	.....	.....	.....	.....	**280**

† average of quarterly values * untrdt rock base substituted for crusher run at this point ** Combined with asphaltic concrete pavement in 4th quarter '56 # Asphaltic & Bituminous Mixes beginning 4th quarter '56 *§ For items and weighted average 1939-40 prices see ENR Dec. 6, 1956, p. 115

GRAVITY dumps the load...in



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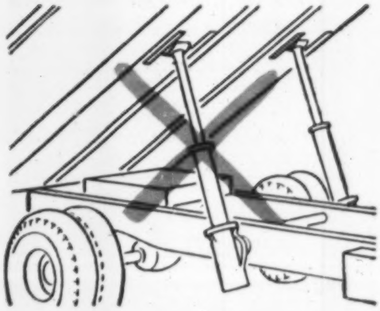

Koehring Dumptor® has no body hoist

Operator drives up, trips the body-release lever — and *gravity* tilts the 6-yard body 70 degrees. One second later the load is out, and Dumptor is on its way back for the next load. It's as simple and fast as that!

There's no 15 to 25-second wait for slow-acting body hoists — no expensive hoist replacement parts, maintenance or down-time. And, you get the same one-second dumping *every time,* under heaviest loads, in all temperature extremes, because Koehring *gravity-dump* never balks — never wears out.

One-second dumping earns a substantial increase in yardage output, too. For example — take a typical 1,000-foot haul where you would normally make 16 trips an hour. By saving an average of 20 seconds dump-time on each trip, Dumptor gains 320 seconds, or 5.3 minutes more productive haul-time per hour. You get 17½ trips, instead of 16. This, alone, adds 9% to hourly production.

This saving is typical of Koehring Dumptor's basic principle — to reduce all non-productive time to a minimum — to increase work-time for more yards per day. See Koehring distributor for complete information.

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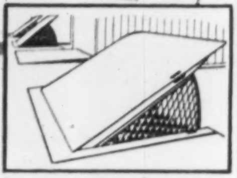
Saves 20 seconds every time it dumps — **Heaviest loads are dumped instantly. Tilting Dumptor body rolls on heavy-duty rockers. Snub chains attached to big shock absorbers check the body at approximately 70-degree tilt.**

Shuttles back and forth without turning — **Dumptor operates with equal ease in either direction. Constant-mesh transmission gives the same 3 travel speeds forward and reverse. Every turn eliminated cuts 15 seconds off cycle time.**

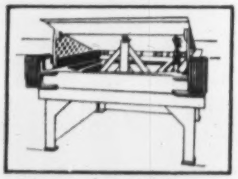
64 square-foot loading target — **Big, square body opening permits loading over either end or sides. Top edge and bottom are box-beam constructed. Sides, ends, heavily rib-reinforced. ½"-thick kick-out pan bolts to floor for rock work.**

AVOID LOADING RAMP PROBLEMS . . .

specify RITE-HITE



manual



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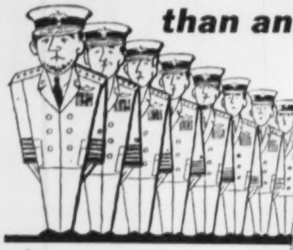

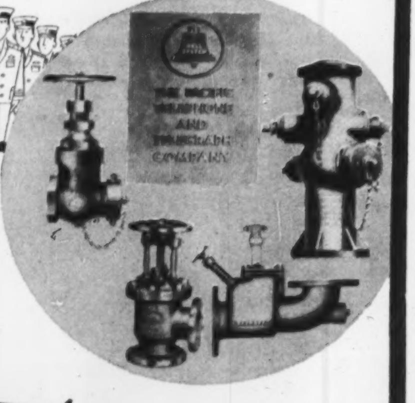

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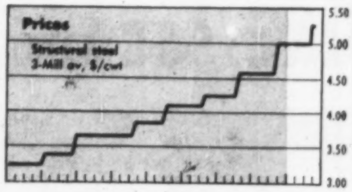
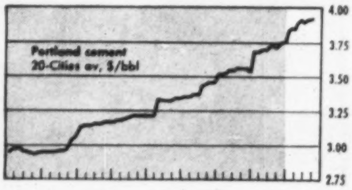
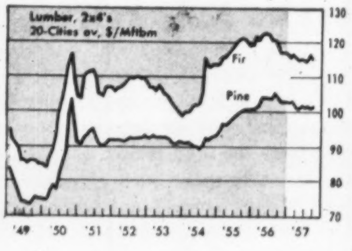






Construction

Materials prices show three different kinds of price trends during 1956-57. These are: fast-rising prices, falling prices, and "tapering" prices. Each includes one of the key materials used in computing ENR's Construction Cost and Building Cost Indexes.

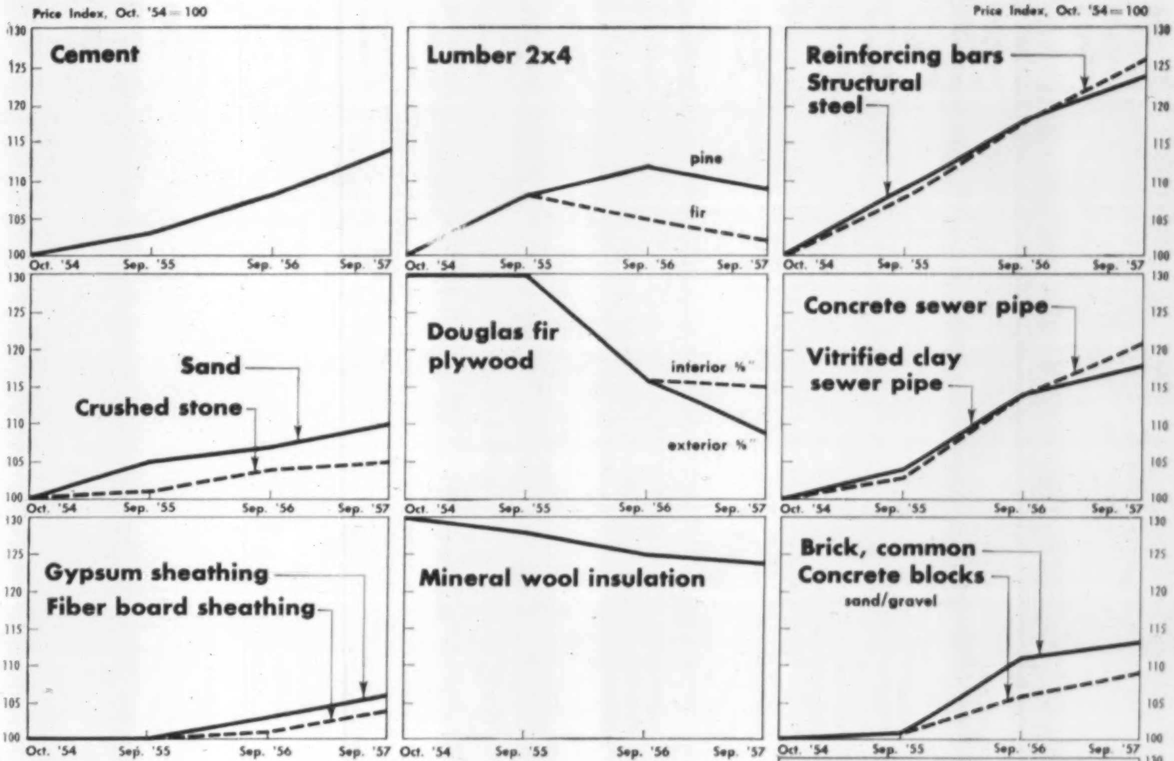
The charts illustrate these trend groups with price indexes based on October 1954 = 100. Cement typifies the stepped-up rate of increase in prices of several materials that are charted below it.

The "soft" spots are in the second column. Lumber prices, (top of this column), for instance, have been falling for more than a year.

The third group, topped by the chart with steel and reinforcing bars shows signs of a slowdown in the rate of the '54-'57 price rise.

• **The fast risers**—Prices of Portland cement and other materials in column 1 showed a tapering rate of increase between 1955 and 1956, but then they rose sharply during this past year.

Gypsum and fiber board sheathing rose steeply in 1955-1956, but shot up even faster from September of 1956 to September of 1957.



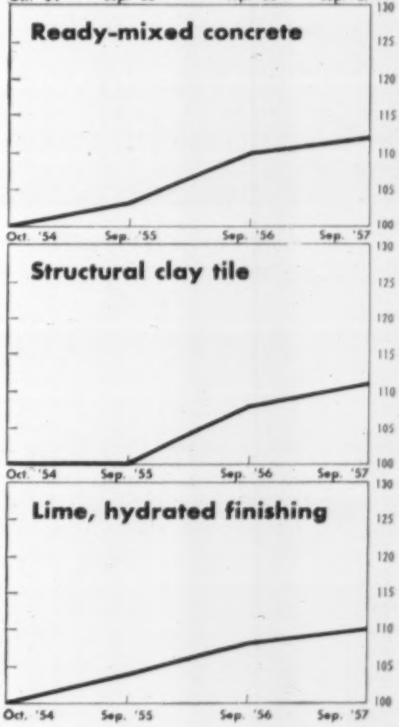
Material Price Trends in '57

Crushed stone, which has tapered off this year, is the only exception to this group.

• The "soft" spots—The group of materials in this column shows the major exceptions to the general price rise in construction material. But aside from lumber prices which are still falling, there are indications of a leveling off in the downward trend in this group.

• Tapering price trends—The third group, headed by steel products, has moved in direct contrast to the second group. Prices in this group rose sharply in 1955-1956, but the past year they have shown some signs of tapering off. It is encouraging that the average rise between September 1956 and September 1957 was 4 index points as against 8 points on the average during 1955-56.

(Continued on page 117)



THESE INDEXES are based on ENR monthly material prices, U. S. averages except for steel (3-mill average) and fir plywood (Seattle base price).

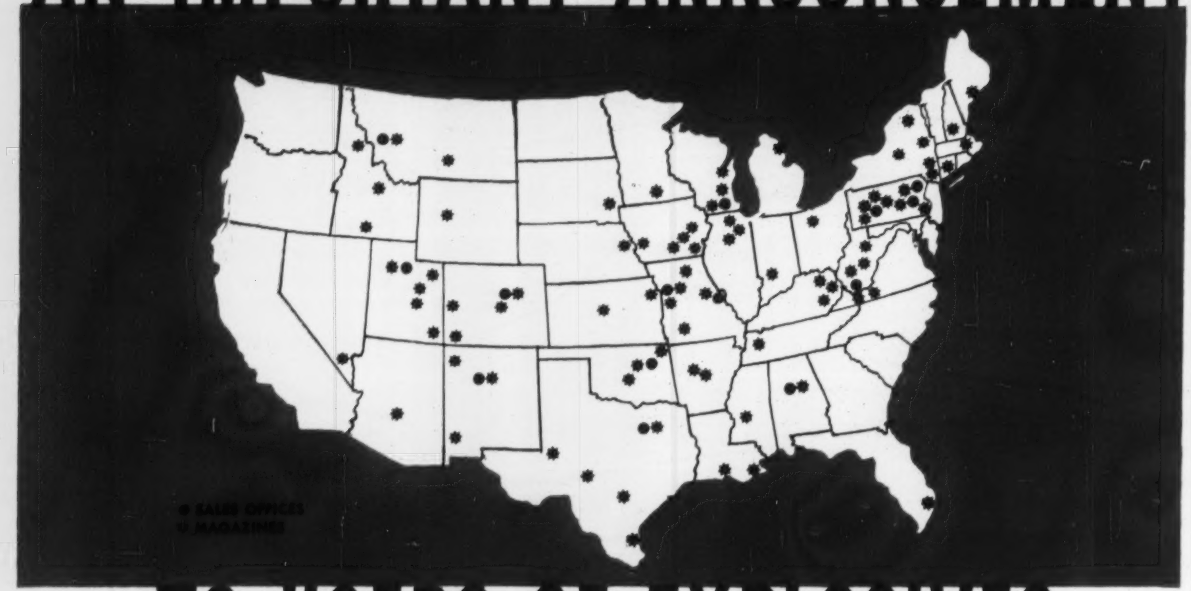
Price Trends for 19 Construction Materials

Prices reported monthly by Engineering News-Record

	1954 October	1955 September	1956 September	1957 September	Per Cent Change 9/56-9/57
Structural steel (average 3 mills), per cwt	$4.25	$4.60	$5.00	$5.275	+5.50
Reinforcing bars (average 3 mills), per cwt	4.30	4.65	5.075	5.425	+6.90
Cement, bulk, per bbl†	3.460	3.555	3.727	3.929	+5.42
Sand, per ton†	2.251	2.352	2.408	2.487	+3.28
Crushed stone, 1½", per ton†	2.661	2.685	2.788	2.807	+0.68
Lumber, 2x4 Fir, per M fbm†	112.888	121.388	118.750	115.431	−2.87
Lumber, 2x4 Pine, per M fbm†	92.967	100.466	104.200	100.967	−3.20
Plywood, exterior ⅝", Seattle base price	190.00	190.00	163.00	150.00	−8.67
Plywood, interior ⅝", Seattle base price	171.00	170.00	147.00	146.00	−0.68
Gypsum sheathing, ½"x2' x 8', per Msf*	59.459	59.141	61.340	63.030	+2.76
Ready-mixed concrete, per cu yd†	12.199	12.601	13.380	13.70	+2.39
Fiber board sheathing, ½" sq. ed, per Msf*	68.742	68.846	69.714	71.275	+2.24
Mineral wool insulation, 3' batts, per Msf*	75.00d	73.420	71.237	70.816	−0.59
Concrete blocks, sand/gravel, 8"x8"x16", each*	.211	.211	.224	.229	+2.23
Brick, common, per M†	33.237	34.580	36.937	37.40	+1.25
Lime, hydrated finishing, per ton, CL†	30.930	32.150	33.340	34.00	+1.98
Structural clay tile, 3x12x12", per M, 2,000 up*	162.115	162.571	175.450	179.214	+2.15
Vitrified clay sewer pipe, std 12", per ft†	1.105	1.151	1.262	1.299	+2.93
Concrete sewer pipe 12", per ft†	.959	1.026	1.137	1.212	+6.60

* Delivered, trucklots † Fob City, CL

AN IMPORTANT ANNOUNCEMENT



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Building Materials Prices

ENR average yearly prices at New York, except steel & cast iron pipe

Year	Brick common per M	Cement per bbl	Lime per bbl	Pine per M ft bm	Steel shapes per cwt h	Pipe cast iron per ton i
1874	$7.41	$1.48R	$1.50a	$26.00d	...	......
1898	6.65	2.25R	.95a	21.75d		
1907	6.16	1.55C	.95a	30.50d	$1.75	$30.75
1913	6.75	1.18C	.915a	25.04e	1.50	21.00
1929	11.71	2.23C	2.25b	64.50f	1.92	38.00
1932	9.75	1.62C	2.25b	39.91f	1.56	30.50
1938	13.10	2.12C	2.80b	59.33f	2.18	44.00
1939	13.46	2.20C	2.80b	64.35f	2.10	42.75
1942	14.17	2.20C	2.80b	85.61f	2.10	45.00
1947	26.38	3.46C	24.34c	115.83g	2.61	70.96
1948	30.33	4.05C	26.32c	114.38g	2.98	86.83
1949	33.00	3.32p	26.80c	98.13g	3.25	86.17
1950	33.50	3.52p	27.10c	131.88g	3.42	84.84
1951	37.92	3.78p	31.00c	154.79g	3.65	96.00
1952	36.45	3.84p	32.00c	155.00g	3.73	97.63
1953	35.33	3.97p	32.00c	156.67g	3.98	102.60
1954	38.92	4.01p	32.00c	157.21g	4.16	104.30
1955	41.00	4.24p	33.67c	166.29g	4.40	106.38
1956	44.00	4.44p	36.75c	171.00g	4.73	115.12

BRICK: wholesale fob; **CEMENT:** net, delivered •*R* Rosendale, rest Portland •*C* in cloth bags delivered (1949-$4.23) price of bags included •*p* in paper bags, fob city in carload lots. **LIME:** •*a* common lump, wholesale, fob, 180 lb., net •*b* 280 lb. •*c* common hydrated, delivered, per ton (40 bags of 50 lb. ea) no longer quoted per bbl. **LUMBER:** No. 1 common, rough •*d* 1-in. yellow pine, wholesale at dock •*e* 3-in. LLYP •*f* 3x12LLYP from Lumber Trade Jl. •*g* 3x12 SLYP (LLYP out of market) **STEEL:** •*h* fob Pittsburgh. **CAST IRON PIPE:** •*i* Pit cast, 6" & larger, Cl B or heavier B&S, fob Birmingham, Ala. Starting in 1950, figures also represent price index for average price per foot of 6-in. to 24-in. sizes Class 150 Federal Specification WW-P-421 Bell & Plain End Centrifugal Cast Pipe in 18-ft. lengths; beginning 1955, same sizes but for Class 150 Standard Conditions Pipe, Federal Specification WW-P-421a and ASA Specifications A21.6 (AWWA C-106)

Wholesale Price Index, Building Materials

Bureau of Labor Statistics, 1947-49 = 100

Month	1947#	1948#	1949#	1950#	1954	1955	1956	1957
Year	94.0	104.0	102.0	109.5	120.2	125.5	130.6	
Jan	88.7	100.7	105.4	102.1	119.6	122.1	129.4	130.5
Feb	89.9	101.2	104.9	103.2	119.2	122.5	129.6	130.5
Mar	91.5	101.8	104.4	104.1	119.3	122.8	130.5	130.5
Apr	92.8	102.0	103.4	104.7	119.0	123.4	131.2	130.7
May	93.0	102.5	102.4	106.3	118.6	124.1	130.8	130.7
June	92.8	103.1	101.5	107.5	118.5	124.1	130.6	130.7
July	93.4	104.5	100.3	109.1	120.5	125.7	130.6	131.4
Aug	94.9	106.7	99.7	112.0	120.8	127.4	131.5	131.3p
Sept	96.2	107.0	99.9	114.4	121.3	128.5	131.0	
Oct	97.1	106.6	100.2	115.8	121.7	128.7	131.0	
Nov	98.3	106.3	100.6	116.3	121.9	128.1	130.8	
Dec	99.2	105.9	101.2	118.3	122.0	128.3	130.5	

Official beginning January, 1952 # Unofficial for Official Index for these years see the 1926 = 100 wholesale price index discontinued by BLS 1952 *p* preliminary

Construction Materials Prices in 22 Cities

Market quotations on construction materials as reported to Engineering News-Record

ENR 22-Cities	CEMENT, Bulk per bbl CL lots, fob city Incl. Dealer Disc 1956 Low	High-Dec	SAND, per ton Truck lots or over fob city 1956 Low	High-Dec	CONCRETE READY MIXED 1:2:4 over 50 cy per cy delivered 1956 Low	High-Dec	BRICK, CLAY BACKING per M quantity delivered 1956 Low	High-Dec	STRUCTURAL CLAY TILE Partition, Score 3 x 12 x 12, per M 2000 pieces or over delivered 1956 Low	High-Dec
Average	3.68	3.77	2.37	2.42	12.93	13.40	35.57	37.19q	169.69	175.45
Atlanta	3.71a	3.71a	2.50‡	2.50‡	13.25	13.75	30.50s	32.44rs	148.25s	148.25s
Baltimore	3.63c	3.82c	2.20‡	2.25‡	12.15	12.75	36.00	36.00	202.00	203.00
Birmingham	3.00d	3.00d	2.08	2.13	11.55	12.30	27.00	27.00	135.00s	135.00s
Boston	4.21a	4.44a	3.00	3.00	13.00	14.00	38.00s	40.00s	200.00w	210.60w
Chicago	3.57a	3.57a	3.75‡f	4.13‡f	13.00	13.50	28.00	30.00	135.00	135.00
Cincinnati	3.70c	3.81c	2.24‡	2.24‡	12.20	12.40	45.00s	45.00s	205.00s	205.00s
Cleveland	3.54e	3.59e	1.65	1.65	16.00h	16.55h	40.00	40.00	192.00	202.50
Dallas	2.85a	2.95a	1.84	1.84	9.40	11.25	19.75	27.75t	......	......
Denver	4.09a	4.09a	1.20	1.20	10.70	10.70	34.00	36.00	......	......
Detroit	3.45ae	3.45ae	4.00‡f	4.00‡f	12.80	14.20	41.00s	44.50s	189.00	213.00
Kansas City	3.71b	3.81b	1.60‡	1.70‡	13.00i	13.50i	29.25	33.00	127.50	127.50
Los Angeles	4.46c	4.68c	2.31‡	2.41‡	12.46j	12.96j	27.50u	30.50u	......	......
Minneapolis	3.94a	4.08a	1.60‡	1.60‡	13.25k	15.10kl	41.00s	43.00s	181.00s	188.00s
New Orleans	3.15a	3.45a	2.00	2.00	13.65	13.65	35.00	40.00	180.00	186.00
New York	3.96a	4.15a	2.00fg	2.15fg	15.50m	16.00m	44.00	44.00	1 1.90x	158.10x
Philadelphia	3.75a	3.90a	2.50‡	2.50‡	13.20n	13.40n	32.00	32.00	156.30	156.30
Pittsburgh	3.76a	3.76a	2.20‡	2.20‡	14.00	14.00	36.00	36.00	138.00	154.00
St. Louis	3.62c	3.63c	2.70	2.75	12.90	13.25o	43.00	43.00	162.00s	178.50s
San Francisco	3.39c	3.59c	2.12	2.12	12.15p	12.50p	39.50	42.50	156.85yz	156.85yz
Seattle	3.75a	3.75a	4.00‡f	4.00‡f	13.30	13.30	43.00	43.00	225.00s	225.00s
Montreal	2.86aa	2.86aa	2.25	2.25	10.80n	10.80n	39.50	42.00	164.00y	170.00y
Toronto	3.77	4.00	1.85	2.00	14.15	15.05	25.00	41.50v	138.70	138.70

•‡ delivered •*a* less 10¢ disc, 15 days •*b* less 2% disc, 15 days •*c* less 10¢ disc, 10 days •*d* fob mill, add $13.11/$19.16 per car, switching charges •*e* fob mill plus freight •*f* per cy •*g* barge lots, asd •*h* 7-9 mi zone •*i* 25 cy or more •*j* 1:2½:3½ •*k* 2500 lb comp •*l* Dec $13.40 •*m* 5 cy or more deliv, Manhattan •*n* 2000 lb comp •*o* Dec $13.00 •*p* 10-100 cy bracket •*q* Dec $37.09 •*r* Dec $30.50 •*s* truckload •*t* Dec $25.75 •*u* fob yard •*v* Dec $25.00 •*w* fob yard, Roxbury •*x* fob trucks, job site •*y* smooth •*z* fob plant, Stockton •*aa* truckload lots, deliv., 10¢ disc, 20 days

LUMBER, No. 2 Common or better, 2x4 s4s

ENR 22-cities		Short Leaf Yellow Pine 1956 Jan. Low	High	Dec.	1957 Jan.	Sept.	Douglas Fir 1956 Jan. Low	High	Dec.	1957 Jan.	Sept.
Average		101.00	105.47	102.93	102.80	100.97	116.74q	122.83	116.74	116.14	115.43
Atlanta	a	77.50	77.50	77.50	77.50	77.50	......	......	......	......	......
Baltimore	b	92.00	98.00	96.00	96.00	96.00	103.00	128.00	123.00	124.00	121.00
Birmingham	a	80.50	81.00	81.00	81.00	82.00	103.50r	114.50	103.50	103.50	105.00
Boston	b	104.00ij	118.00i	107.00i	108.00*	106.00*	113.00cm	129.00c	116.00c	117.00c	113.00c
Chicago	d	92.00k	100.00	92.00	91.00	91.00	115.00	125.00	117.00	116.25	118.00
Cincinnati	b	83.00	90.00	90.00	90.00	87.00	107.75t	116.00	107.75	99.75	104.00
Cleveland	d	98.00	109.00	99.00	99.00	97.00	108.00	123.00	113.00	113.00	114.00
Dallas	a	72.00	75.00	75.00	74.00	65.00	......	......	......	......	......
Denver	b	......	......	......	......	......	118.75	135.00	135.00	135.00	122.50
Detroit	e	108.00l	114.00	114.00	114.00	115.00	125.00	133.00	130.00	130.00	127.75
Kansas City	b	120.00m	130.00	120.00	120.00	120.00	125.00u	140.00	125.00	125.00	120.00
Los Angeles	f	......	......	......	......	......	95.00v	112.00	95.00	95.00	95.00
Minneapolis	g	......	......	......	......	......	140.00	145.00	145.00	145.00	140.00
New Orleans	a	94.50	96.50	96.50	96.50	94.00	103.00w	126.00	103.00	103.00	104.50
New York	h	120.00n	127.00	120.00	117.00	116.00	120.00m	129.50	120.00	119.00	117.00
Philadelphia	e	127.00	127.00	127.00	127.00	119.00	147.00	147.00	147.00	147.00	135.00
Pittsburgh	a	98.00o	130.00	130.00	130.00	125.00	125.00u	135.00	130.00	130.00	145.00
St. Louis	g	119.00p	127.00	119.00	121.00	124.00	133.00z	144.00	133.00	132.00	137.00
San Francisco	a	......	......	......	......	......	84.00s	97.00	84.00	85.00	82.00
Seattle	a	......	......	......	......	......	74.00x	81.00	74.00	72.00	73.00
Montreal		92.00i	100.00i	92.00i	92.00i	94.00i	170.00	180.00	180.00	180.00	180.00
Toronto		95.00i	106.00	96.00i	98.00i	90.00i	118.00y	138.00	118.00	128.00	120.00

•*a* fob mill •*b* fob city, CL, out of yard •*c* asd •*d* fob city, CL, dir mill •*e* deliv to contr •*f* retail LCL at yard •*g* retail LCL deliv •*h* deliv truck lots •*i* spruce •*j* Jan $105 •*k* Jan $93 •*l* Jan $113 •*m* Jan $125 •*n* Jan $122.50 •*o* Jan $110 •*p* Jan $122 •*q* Jan $119.21 •*r* Jan $108.50 •*s* Jan $84 •*t* Jan $113.50 •*u* Jan $135 •*v* Jan $102 •*w* Jan $121 •*x* Jan $75 •*y* Jan $120 •*z* Jan $134 •* hemlock

Major Items in BLS Building Materials Price Index—1947-49=100

	August 15 1947	1948	1949	1950	1954	1955	1956	1957
All Building Materials	**94.9**	**106.7**	**99.7**	**112.0**	**120.8**	**127.4**	**131.5**	**131.3**
Lumber & Wood Products								
Douglas Fir	99.2	113.8	92.0	133.0	124.5	134.1	128.9	117.0
Southern Pine	95.2	105.9	92.1	114.3	111.5	115.1	119.1	113.5
Other Softwoods	91.0	111.7	103.2	124.6	130.2	138.4	137.5	133.7
Hardwoods	96.0	108.7	90.8	117.3	112.1	120.4	126.6	118.4
Millwork	87.6	108.1	107.2	116.4	130.1	128.3	129.5	128.3
Plywood, Softwood	83.3	119.7	90.6	116.7	114.7	110.7	95.4	88.6
Plywood, Hardwood	96.1	105.8	92.9	106.1	98.8	102.6	105.2	103.4
Nonmetallic Minerals								
Portland Cement	92.6	104.8	105.2	107.1	128.3	131.8	139.8	147.2
Concrete Ingredients*	94.0	103.3	105.0	106.2	122.2	125.3	130.7	136.5
Concrete Products	95.5	102.2	103.9	105.1	118.1	118.6	123.4	126.4
Plate Glass	96.3	104.4	104.4	112.7	132.0	137.5	145.7	145.7
Window Glass	95.6	105.1	103.9	109.0	131.3	138.8	145.9	145.9
Gypsum Products	92.5	104.1	102.3	104.7	122.1	122.1	127.1	127.1
Prep. Asph. Roofing	94.4	103.6	102.6	100.5	98.6	114.5	117.5	125.8
Struct. Clay Products	93.9	104.2	105.2	112.3	132.1	142.9	150.1	155.0
Insulation Materials	97.0	100.9	96.5	102.3	108.3	n.a.	100.9	103.1
Paint & Paint Materials								
Prepared Paints	98.7	100.6	98.0	99.5	112.8	114.8	119.1	128.1
Paint Materials	93.3	101.7	93.1	90.8	97.8	97.6	98.3	100.5

*Includes Portland cement

	August 15 1947	1948	1949	1950	1954	1955	1956	1957
Building Paper & Board	91.8	105.5	103.8	108.6	127.9	133.3	138.1	141.7
Metals & Metal Products								
Structural Shapes	89.9	112.4	112.4	120.4	146.2	157.5	170.5	192.3
Bars, Concrete Reinf	92.5	111.9	111.9	115.2	156.4	164.3	177.4	189.6
Pipe, Black Steel	93.1	108.1	110.1	115.1	144.0	157.1	176.5	190.3
Pipe, Galvanized	92.6	107.1	106.2	114.4	130.1	141.9	159.9	165.2
Cast Iron Soil Pipe	85.1	112.8	101.7	102.9	105.5	111.3	112.8	115.1
Copper Water Tubing	97.5	108.9	93.9	111.5	136.5	158.1	170.1	146.1
Sheets, Galvanized	94.8	108.8	101.9	119.9	133.0	143.2	153.1	153.1
Sheets, Aluminum	94.7	102.2	105.9	107.7	136.3	146.0	158.6	166.8
Metal Doors, Sash, Trim	97.2	102.8	102.8	107.3	131.4	146.4	147.5	142.8
Nails, 8d	86.8	112.0	112.0	114.9	144.5	159.4	173.7	182.2
Building Wire	103.6	116.4	78.3	91.1	92.5	132.1	156.3	137.4
Nonmetal Sheathed Cable	105.4	115.2	75.7	84.5	80.2	89.2	112.9	85.0
Hardware, Finished	97.9	105.1	101.9	115.8	138.5	146.1	158.2	165.8
Plumbing Equipment	94.8	104.9	102.2	109.5	118.5	128.1	134.1	129.0
Heating Equipment	95.0	102.7	102.5	105.4	114.0	115.5	119.1	122.7
Basement Oil Tank	99.8	111.6	84.4	86.7	102.2	117.5	127.1	134.8
Machinery								
Elevators & Escalators	95.6	100.0	105.2	104.9	118.0	122.6	129.7	138.9
Fans and Blowers	88.7	104.5	113.7	122.1	143.7	154.4	171.3	177.4
Incandescent Lamps	95.9	104.6	104.6	104.6	136.9	147.2	144.9	160.5

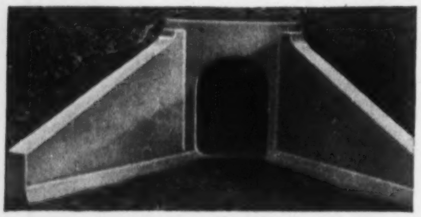
STRATEGICALLY LOCATED AMERICAN-
CONCRETE PRODUCTS FOR MULTI-

ROUND PIPE

As the nation's largest maker of concrete culvert and drainage pipe, American-Marietta offers contractors round pipe of known permanence and performance. A full range of sizes is available, with pre-tested strengths to meet various specifications. For extreme loads see Hi-Hed Pipe, below.

HI-HED PIPE

Elliptical Hi-Hed Reinforced Concrete Pipe permits greater self-cleansing velocities in dry weather periods. Also perfect for drainage structures under unlimited fills because Hi-Hed has 50% greater strength than its round pipe equivalent.



FLAT BASE PIPE

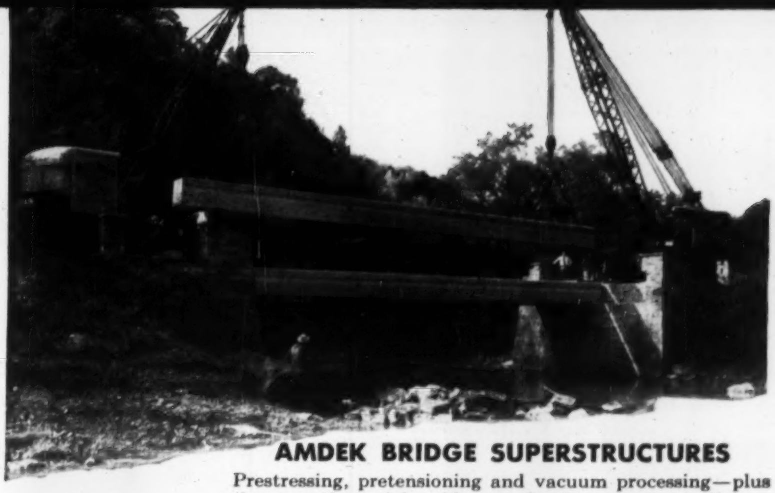
Save as much as 30% in the construction of pedestrian underpasses, culverts and cattle passes with pre-cast Flat-Base Pipe. Can be jacked under highways without disturbing traffic.

CONCRETE CRIBBING

Used as a retaining wall, both open-faced and closed-face "King-Size" Cribbing offer flexible construction unaffected by movements that crack monolithic walls.

MARIETTA PLANTS READY TO SUPPLY BILLION DOLLAR HIGHWAY PROGRAM

A giant in the construction materials industry, American-Marietta offers a related group of essential concrete products for use in building and rebuilding the nation's highways. American-Marietta has expanded its plants to supply the increased demand and to prepare for still more volume. Manufacturing facilities are strategically located throughout the United States to assure distribution near points of use. Send for complete information about any of the products illustrated on these pages.

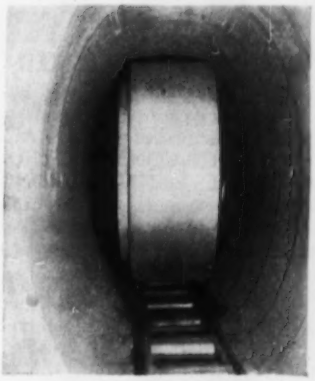


AMDEK BRIDGE SUPERSTRUCTURES

Prestressing, pretensioning and vacuum processing—plus the use of special voids—results in a stronger, lighter bridge member that can be handled like steel beams in any weather. Pre-cast Amdek sections, above, were positioned in just six hours. Amdek eliminates painting and maintenance.

LO-HED PIPE

Elliptical Lo-Hed Pipe carries a greater flow than its round equivalent—in a minimum depth of cut with increased depth of cover. Easier to lay, to grade and line. Pre-tested strengths to answer any low headroom problem.



INNER CIRCLES

Tunneliner Process allows passing of pipe through pipe underground without requiring excavations or disruption of surface traffic. Work progresses regardless of weather conditions.

Our technical staff will be pleased to assist you with your problems.

PROGRESS IN CONCRETE

A-M

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CONCRETE PRODUCTS DIVISION

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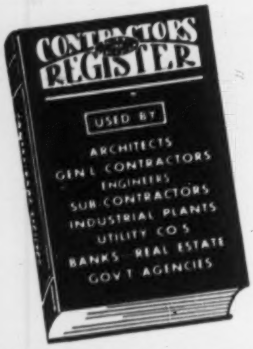

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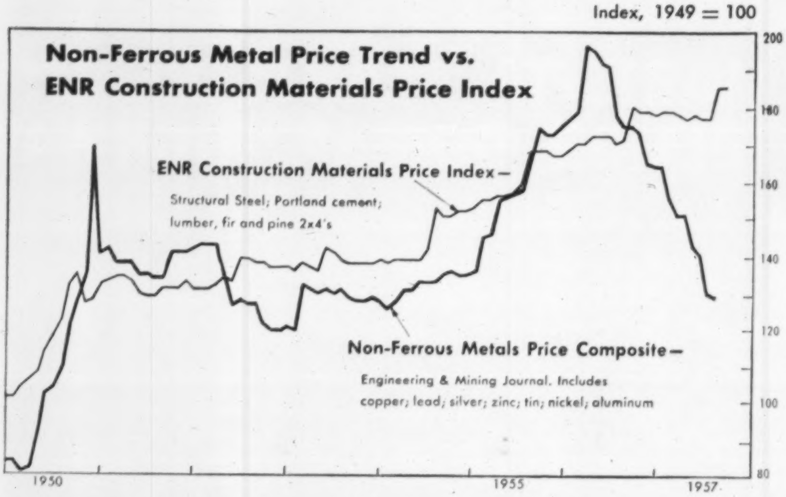

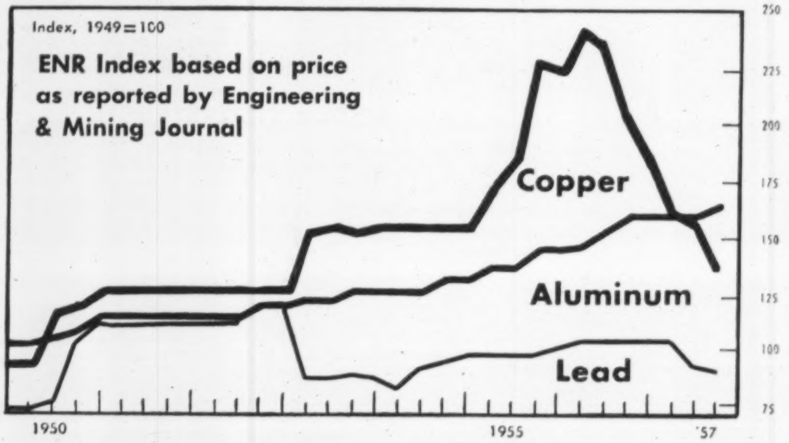

Non-Ferrous Metals Prices Skidding

Falling prices of non-ferrous metals, which hit their peak in the first quarter of 1956, contrast sharply with prices of other construction materials. The price index of construction materials rose 15 points in the last year and a half, while in the same period the index of non-ferrous metals prices took a nose dive of 65 points (see top chart above). Comparison of the two indexes in the top chart shows considerable similarity of movement from 1950 to 1956, but March 1956 saw a break in the pattern which continues to widen. However, the fall in non-ferrous metals prices is not general throughout the group. Aluminum continued to show an average quarterly rise of 2%.

Much of the drop in the index of non-ferrous metals as reported by Engineering and Mining Journal, a McGraw-Hill publication, can be attributed to copper. Comparing the index in the top chart with the index for copper (lower chart), a clear resemblance emerges. From its highest peak since the Civil War the index of copper prices fell 105 points from 243 in the first quarter of 1956 to 138 in the third quarter of 1957. Lead prices during this period held steady until the first quarter of this year, when a downward turn began.

Aluminum prices are the exception in the general picture of non-ferrous metals. They have increased at a fairly steady rate (see lower chart) of 8% a year. But for the first time in its history aluminum is in oversupply. Moreover, there are no indications that aluminum producers intend to cut back production.

Generally the sharp drop in non-ferrous metals prices is the result of softening demand following on the heels of a production spurt. Only a year ago copper was one of the scarcest of the major non-ferrous metals, while today there is a falling off of sales. And while aluminum companies are producing at near capacity, inventories are piling up.

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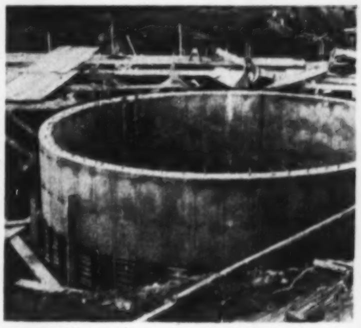


2

ECONOMY Steel Forms are furnished on a rental basis for your:

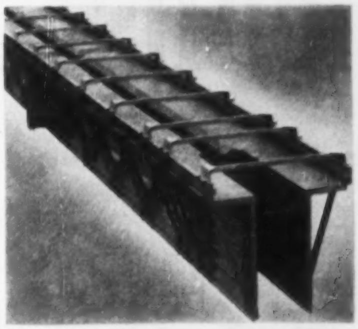
(a) Larger unusual form requirements.

(b) More difficult form requirements. These forms are supplied with supervisory service.

3

SPECIAL ECONOMY Forms are available on a purchase basis. These are designed and manufactured to your specifications. At right is shown an all steel girder form for:

PRECAST PRESTRESSED CONCRETE



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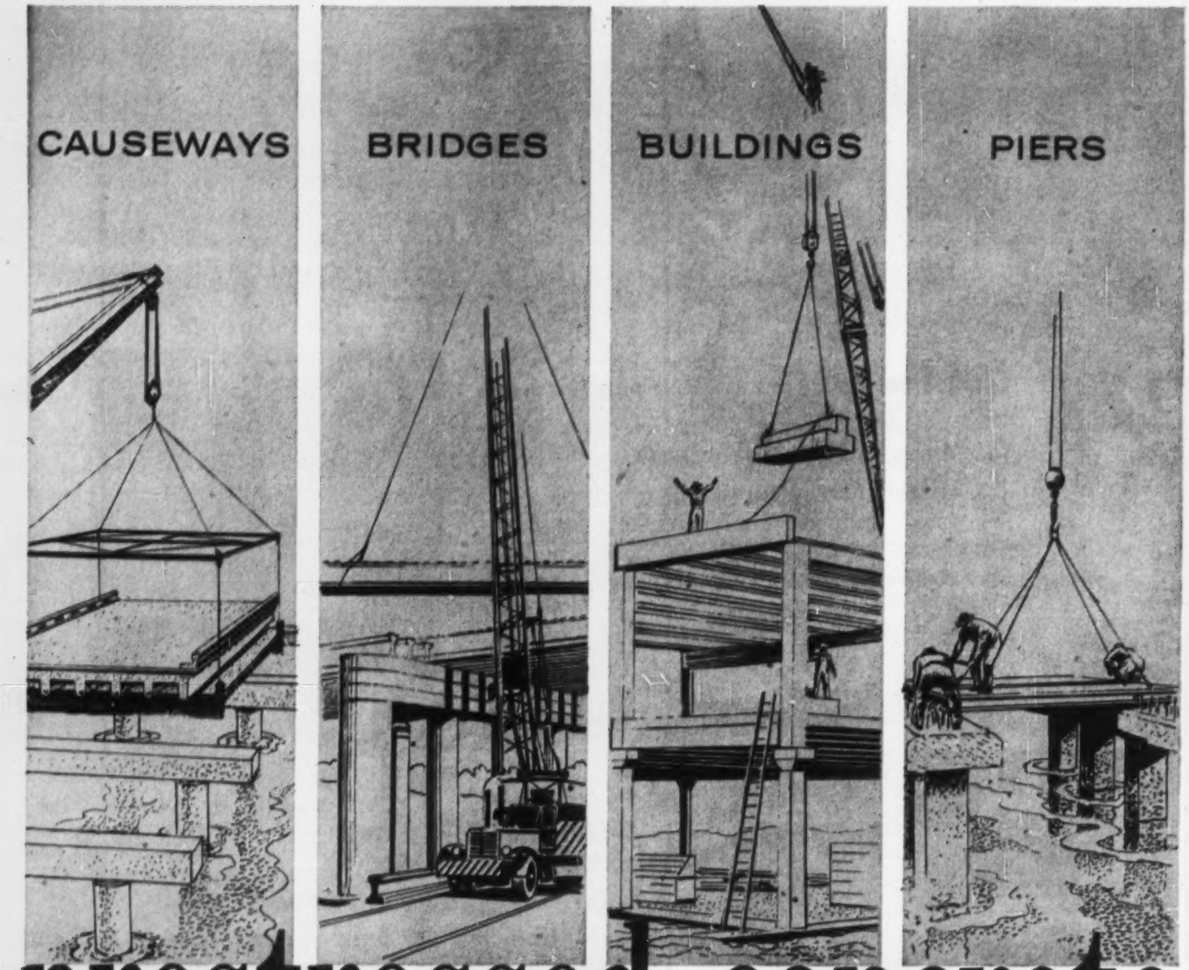

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The Dextone Company
166 Chapel Street
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Empire Prestressed Concrete of Oregon
9255 N. E. Halsey Street
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Goodstone Mfg. Co. Inc.
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Economy Cast Stone Co.
15 East Franklin St.
Richmond, Virginia

F. Hurlbut Co.
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Formigli Corporation
2050 Locust Street
Philadelphia, Pa.

Lewis Mfg. Co. Inc.
3044 S. W. 28th Lane
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Precrete, Inc.
130-01 Northern Blvd.
Corona, N. Y.

New England Concrete Pipe Corp.
99 Needham Street
Newton Upper Falls 64, Mass.

Mid-South Concrete Pipe Co.
1977 Chelsea Avenue
Memphis, Tennessee

Materials Prices October Monthly Market Quotations by ENR Field Reporters

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT* Per bbl. C/L lots cash, dis. not deducted			SAND AND GRAVEL Per ton, carload lots			CRUSHED STONE Per ton, carload lots		CRUSHED SLAG Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK 8x8x16-in.* truckload del.* per block		CONCRETE Ready Mixed 1:2:4 del. 50 cy & over
	Paper	Bulk	Mortar	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand grav.	Lt. wgt. agg.	
Atlanta	$4.31a	$3.90a	$3.57	$2.18	$2.28	$2.50‡	$2.18	$2.33	$1.55	$1.65	$0.175	$....	$13.75g
Baltimore	4.45c	4.05e	3.52c	2.80‡a	2.80‡a	2.25‡a	2.85‡a	2.90‡a	2.05‡a	2.00‡a	.18	.18a	12.95/13.45
Birmingham	4.08	3.15f	....	2.53n	2.53n	2.13n	2.75	2.75	1.55	1.65	.18	.18	12.55
Boston	5.75be	4.67a	4.79e	3.00a	3.00a	3.00a	1.75a	1.85a	....	....	.23	.275a	15.00h
Chicago	4.13a	3.72a	3.65/3.78	3.78‡b	3.78‡b	4.13‡b	3.95‡b	3.95‡b	2.25‡	2.25‡	.25	.25b	13.50
Cincinnati	4.46c	4.05e	4.03	2.29‡c	2.34‡c	2.34‡c	2.64‡c	2.64‡c	1.89	1.89	.19	.24a	13.25
Cleveland	N.A. in C.L.	....	3.88a	2.15ef	1.95f	1.65	4.50‡a	4.50‡a	3.35‡a	3.35‡a	....	.215	16.15
Dallas	3.55a	3.15a	3.43	2.60	2.65	1.90	2.43	2.63	....	....	....	.27	11.25
Denver	4.69a	4.19a	4.69	1.90	2.05	1.20	....	....	....	....	.22	.245a	10.70
Detroit	4.10a	3.60ag	3.73	4.50‡b	4.50‡b	4.25‡b	3.75‡	3.75‡	3.50‡	3.50‡	.23	.34a	14.20
Kansas City	4.45i	3.96a	4.25	....	....	1.70‡a	2.00‡a	2.00‡a	....	....	.23a	.26c	14.00
Los Angeles	5.12ch	4.68ch	5.60	2.56‡a	2.76‡a	2.41‡a	2.41‡a	2.46‡a	....	....	.14fm	.24m	12.96ih
Minneapolis	4.44a	4.04a	4.10	2.70‡ag	2.70‡ag	1.60‡ag	3.25‡ag	3.25‡ag	....	....	.19	....	14.30f
Montreal	3.21d	2.96d	3.60	1.95‡a	2.20‡a	2.25‡a	1.95‡i	2.20‡i	2.00	2.00	.20	.30a	10.80ak
New Orleans	3.75a	3.45a	3.70	2.44	2.44	2.00	....	....	1.45	1.65	.275	....	13.65
New York	4.83a	4.42a	3.72	3.20bk	3.20bk	2.30bk	3.10bl	3.10bl	....	....	.265	.32b	17.40an
Philadelphia	4.57‡a	4.16‡a	3.61‡	2.85‡a	2.85‡a	2.35‡a	2.70‡	2.80‡	2.00	2.35	.25/.32	....	14.15do
Pittsburgh	5.50bjk	4.47bj	5.00bjl	2.60aq	2.60aq	3.00aq	2.00e	2.00e	2.10	2.10	.26	.28	15.55
St. Louis	4.01/4.33c	3.61/3.93c	3.86/4.18	3.25am	3.10am	2.40/3.10am	1.65j	1.75j	....	....	.24	.30e	12.40/12.90
San Francisco	3.94c	3.54c	4.38c	2.02	2.02	2.12	2.17	2.17	....	....	.24	.28di	12.75e
Seattle	4.30a	3.75a	4.45a	4.00‡bm	4.00‡bm	4.00‡bm	4.50‡bm	4.50‡bm	....	....	.26	.37c	13.30j
Toronto	4.03	4.03	4.03	2.40‡	2.40‡	2.05‡	2.20	2.20	2.20	2.20	.25	.275c	15.25

‡ Delivered. * Prices incl. dealers discount except as noted.

CEMENT: *a Less 10¢ disc, 15 days. *b Less 2% disc, 15 days. *c Less 10¢ disc, 10 days. *d Truckload lots, deliv. 10¢ disc, 20 days. *e Truckload lots *f Fob mill, add 14.58 to $21.31 per car switching charges *g fob mill + freight *h LCL. *i Less 2% disc, 10 days *j Truck lots, fob yard *k 100 bag lots *l over 150 sacks

SAND GRAVEL, STONE & SLAG: *a Truck lots. *b Per cu. yd. *c 5 tons or more. *e ½". *f Pea gravel. *g Less 5% for cash. *h Less than 5 tons. *i Plus 5% mun. & prov. tax *j F.o.b. quarry. *k Barge lots asd. *l F.o.b. scow Hudson river. *m Less 2% for cash. *n F.o.b. cars. *q fob yard

CONCRETE BLOCK: *a Cinder *b Waylite. *c Haydite. *d Celocrete *e 5¼ x 8 x 12 in. *f 8 x 4 x 16. *g F.o.b. truck at job. *i F.o.b. plant San Rafael. *m F.o.b. yard.

READY MIXED CONCRETE: *a 5 cu. yds. or over del. Man. *b 25 cu. yds or more *c 10-100 cy. brackets. *d 1-3 mi. zone. *e 2,000 lb comp. *f 2,500 lb. comp *g Less 25¢ disc, 15 days. *h Less 50¢ for cash. *i 5% off for cash. *j 2% off for cash. *k Federal tax included. Add 5% mun. & prov. *l 1:2½:3½. *m F.o.b. yard. *n Plus escalator clause. *o Add 15¢ for ea. add'l 1-mi zone.

CASH DISCOUNTS CEMENT to Contractors: Truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10¢ per bbl. for payment within 15 days of date of invoice. Subject discount 10¢ per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES AT CEMENT MILLS

Charge for bags not included. For paper bags add 40¢ per bbl., not refundable.

	Bulk		Bulk		Bulk		Bulk		Bulk
Richard City, Tenn	$3.30†	Buffington, Ind	$3.25†	Steelton, Minn	$3.45†	Muskegon, Mich	$3.30†	Toledo, O	$3.30†
Clinchfield, Ga	3.30†	Independence, Kan	3.10†	Leeds, Ala	3.15†	Saginaw, Mich	3.30†	Milwaukee, Wis	3.35†
Kingsport, Tenn	3.30†	Hannibal, Mo	3.35†	Duluth, Minn	3.45†	Wyandotte, Mich	3.30†	Green Bay, Wis	3.35†
West Des Moines, Iowa	3.35†	Northampton, Pa	3.35†	Hudson, N. Y	3.35†	Buffalo, N. Y	3.40†	Ironton, O	3.30†
Nazareth, Pa	3.35†	Universal, Pa	3.45†	Alpena, Mich	3.20†	Oswego, N. Y	3.45†	Montreal City	2.56†
Bath, Pa	3.35†	Waco, Tex. (+ 10¢ tax)	3.35†	Detroit, Mich	3.30†	Cleveland, O	3.35†	W. Winfield, Pa	3.45†
Lesley, Pa	3.35†	Giant, S. C	3.35†	Howes Cave, N. Y	3.35†	Alsen, N. Y	3.35†	Security, Md	3.35†

† *Prices to hold for fourth quarter of* 1957.

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES Per gal., 80-300 penetration		CUTBACK ASPHALT MC per ton		ROAD OIL	ASPHALT EMULSION RSI Per gal.	
	Granite Per M lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Per gal. Tank car	Tank car	Drums
Atlanta	......	......	......	$30.50	$45.00	$0.15	$0.26	$0.125Pw	$0.28Pw	$0.14	$0.125	$0.30
Baltimore	150.00‡	......	......	23.00i	......	.095i	0.185i	.10iwE	.19iwE	.10i	.105i	0.195i
Birmingham	......	62.00i	......	......	......	......	......	......	......	......	......	......
Boston	......	......	......	24.00ap	46.00ap	24.00as	46.00as	.11aFw	.24aFw	.11ao	.174aGo	.25aGo
Chicago	150.00‡	90.00‡b	3.95/4.00‡j	24.25b	34.25b	21.40bs	31.40bs	.11bwH	.19bwH	.085b	......	......
Cincinnati	......	......	......	......	......	......	......	......	......	......	......	......
Cleveland	......	89.50d	6.30g	25.00A	......	25.00A	......	.1115AwF	......	......	.1115AG	.21AG
Dallas	e	40.00	e	26.35	45.39	.1116	.1944	29.80	51.40	.1080	.1116	.1994
Denver	......	56.00	......	......	......	......	......	......	......	......	......	......
Detroit	......	115.00	......	32.45	......	32.45s	......	.1361wI	......	.1133	......	.25
Kansas City	e	e	e	18.00el	......	18.00s	......	.0925cwJ	......	.085c	0.125c	......
Los Angeles	e	......	e	21.00dmz	......	21.00dsz	......	22.50dzK	......	21.50ds	.097	.197
Minneapolis	......	......	3.73h	29.50	......	29.50	......	0.125w	......	0.115	.134	......
Montreal	e	e	e	32.50n	44.80n	.176n	.226n	18.70nuE	23.70nuE	.154n	.242ns	.27ns
New Orleans	......	......	......	20.00e	......e	20.00ev	......e	.095ew	......e	.085B	.095BL	......
New York	......	......	3.70f	26.89qCD	47.32qD	26.89qCD	47.32qD	.1273wCDF	.2139wDF	......	.1273CD	.2168D
Philadelphia	175/185	110/120	4.06	24.00	......	24.00	......	.11wF	......	.105	......	......
Pittsburgh	60.00k	99.12ln	6.35	28.30i	......	30.90is	......	.1351i	......	.14‡	.1351i	......
St. Louis	......	......	......	22.90f	......	.1825	......	.1035fwM	......	0.165	.825	......
San Francisco	......	70.00c	......	23.00g	40.00g	23.00gks	40.00gks	24.00gN	41.50gN	23.75sg	.10y	.19y
Seattle	......	......	......	27.00s	40.50h	27.00s	......	28.50K	......	24.75hs	.10h	.11hr
Toronto	......	125.50	4.50	40.10	59.38	0.2004	0.2445	0.214w	0.258w	0.198	0.216	.271

‡ Delivered.

PAVING BRICK & BLOCK: *b 3 x 4 x 8. *c 2¼ x 8¼ x 4. *d LCL, truck deliveries. *e Not used. *f 2" interior 8# treat. *g 3" *h 2" tr, 8# *i 3 x 3⅝ x 8½. *j 2½", 6 lb. tr. *k Used. *l Redshale; clay $101.32. *m Pine; oak $6.57. *n Truck del.

ASPHALTS: *a Price at plant, Everett, Mass. *b F.o.b. refinery, Lockport, Ill. *c F.o.b. Sugar Creek, Mo. *d F.o.b. refinery, El Segunda. *e F.o.b. Baton Rouge. *f F.o.b. Wood River, Ill. *g F.o.b. Richmond, Calif. *h F.o.b. Martinez. *i F.o.b. refinery, Baltimore. *j F.o.b. refinery, Inglewood, Calif. *k 50-110 penetr. *l Less than 100 penetr. *m 40/80 penetr. *n Fed. tax included; add 5% for mun. & prov. *o Drums not avail. Shipped in steel bbl. *p 60/70 penetr. *q 40/300 penetr. *r In customer's drums. *s Shipped in drums, per drum. *t 85/300 penetr. *u Per 100 gal. *v Per ton. *w Per gal. *x Also tank trucks. *y F.o.b. Oakland. *z F.o.b Edmonds. *A F.o.b. refinery, Cleveland. *B F.o.b. Destrehan, La. *E RC. *F Also RC. *G Also MS, SS. *H RC 0-5 incl. *I MC 4. *J MC, RC $0.095 *K MC 3, 4 & 5. *L MS. *M MC 1-5, RC 1-5, $0.106. *N MC 3. *O Truckload. *P F.o.b. refinery Savannah: $0.09/gal., tank cars; $0.20/gal., drums. *Q F.o.b. Eldorado, Ark.

• Next Report: See ENR Nov. 7

Materials Prices

October Market Quotations by ENR Field Reporters

IRON AND STEEL PRODUCTS—PER 100 LBS. BASE MILL PRICES

	STRUCT SHAPES	PLATE CARBON STEEL	REINF BARS* billet	RIVETS ½-in. structural	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	STEEL RAILS Per Net Ton Light	TRACK SUPPLIES Angle Bars	TRACK SUPPLIES Std Spikes	TRACK SUPPLIES Tie Plates	TRACK SUPPLIES Track Bolts
Birmingham Area	$5.275	$5.10	$5.425	$12.25	......	$110.50	$130.00	$6.975	$9.75	$6.60	......
Chicago Area	5.275	5.10	5.425	12.25	$6.225	110.50	130.00	6.975	9.75	6.60	......
Pittsburgh Area	5.275	5.10	5.425	12.25	6.225	110.50	130.00	6.975	9.75	6.60	$14.75
Buffalo Area	5.275	5.10	5.425	12.25	6.225	110.50	130.00	6.975	9.75	6.60	14.75
Cleveland	......	......	5.425	12.25	6.225	......	......	......	......	......	14.75
Youngstown Area	......	......	5.425	......	......	......	......	......	9.75	......	......
Geneva	5.275	5.10	......	......	......	......	......	......	......	......	......
Los Angeles	5.975	......	6.125	......	6.225	......	......	......	9.75	6.75	......
Pueblo	......	......	......	......	......	......	......	69.75	9.75	6.60	......

* Fairless Works, $5.575.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS Per 100 lb., base price 5 tons to carload lot New billet	REINFORCING BARS Rail steel	EXPANDED METAL LATH‡ Per 100 sq. yd., carload lots Std. diamond mesh. 3.4 lb.	EXPANDED METAL LATH‡ Std. ribbed 3.4 lb.
Atlanta	$8.74	9.25	$8.43t	$52.00	$57.00
Baltimore	9.45	8.45j	....	42.00	46.50
Birmingham	8.64t	8.60t	8.60t	66.25p	71.00p
Boston	9.63s	8.25	8.25	46.50	51.00
Chicago	8.79E	6.91gu	6.91gu	52.00‡	63.00‡
Cincinnati	9.18ak	9.08rs	....	43.50mn	48.00mn
Cleveland	9.01	6.89c	....	44.50‡	49.00‡
Dallas	10.25	8.85	8.85	61.00	66.50
Denver	9.82	8.95c	....	57.00n	63.00n
Detroit	9.18	7.15g	....	45.00	49.50
Kansas City	9.31a	8.10	....	49.00	60.00
Los Angeles	9.35fd	7.35	....	58.50	64.50
Minneapolis	9.08d	9.26b	9.26b	41.50	46.00
Montreal	8.25–900iC/8.30–8.70A	7.75/9.95F	7.75/9.95F	66.00h	70.20h
New Orleans	....	7.70gks	....	45.50	50.00
New York	9.15s	8.35y	8.35y	50.50n	57.00no
Philadelphia	8.80/9.00	7.80/8.00	....	42.50‡	47.00‡
Pittsburgh	8.64t	6.75t	....	46.00‡w	49.50‡w
St. Louis	9.10s	8.45c	8.45c	61.00l	62.00l
San Francisco	9.t0	9.45j	....	51.00	54.00
Seattle	9.80D	8.85e	....	62.00nr	68.00nr
Toronto	8.85*	7.85	7.85	59.50nq	62.75nq

Quantity extras, per cwt: under 100#, +$9; 100–399#, +$6; 400–999#, +3.50; 1000–1999#, +1.00; 2000–4999#, base price; 5000–9999#, −10¢; 10,000–19,999#, −30¢; 20,000–29,999#, −50¢; 30,000# and up, −70¢

EXTRAS, per cwt—♦Quantity (applies to LCL shipments only): under 1,000#, +$1.80; 1000–1999#, +$1.50; 2000–4999#, +$1.20; 5000–9999#, +90¢; 10,000–19,999#, +60¢; 20,000–29,999#, +30¢; 30,000–39,999#, +10¢; 40,000# & up, none. ♦Size†: #2 +$2.50; #3 +$1.40; #4 +$1.00; #5 +70¢; #6, #7, #8, #9, #10, #11 +50¢. ♦Bending: heavy, +90¢; light +$2.20 (except in New York City and surrounding metropolitan area where bending must be done on the job). ♦Engineering (details and placing from designs by others): over 500 tons, +45¢; 200–499 tons, +50¢ but not over $4500; 75–199 tons, +65¢ but not over $2000; 20–74 tons, +75¢ but not over $975; 5–19 tons, +85¢ but not over $300; under 5 tons, +$1.00 but not over $85. Min. charge $25. Design only: +60¢.

WELDED FABRIC REINFORCING
Per 100 sq ft., carload lots fob mill

4 × 16 in., No. 8 & 10 wires—
Joliet, Ill., Donora, Pa., Monessen, Pa. $3.98

4 × 12 in., No. 8 & 12 wires—
Joliet, Ill., Donora, Pa., Monessen, Pa. $3.62

6 × 6 in., No. 6 & 6 wires—
Joliet, Ill., Donora, Pa., Monessen, Pa. $4.17

*‡ Delivered. ** Aver. of Canadian & American. *a 2000–9999# *b 10,000–15,999#, fob city *c 20 tons or over *d 10,000–19,999# *e Intermediate struct'l *f Incl. delivering in free zone *g CL *h list price; dominion tax exempt; add provincial and municipal taxes *i add dominion, provincial and municipal sales taxes *j intermediate and hard grade *k fob city *l delivered; contractor to do unloading *m copper alloy *n LCL *o asphalt coated *p del. of 500 sq. yd. or more. *q 3 lb *r 2% off for cash *s 2,000–4,999# *t add 15¢ del. *u add 6.25¢ switch *v incl 15¢ del. *w truck lots. *x add 5¢ switch *y add 15¢ del. *z add 10¢ del. *A American made. *C Canadian made. *D ½% for cash. *E 30,000# or over.
* F Federal tax exempt.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE PRICE INDEXa	ASBESTOS CEMENT PIPE per lin. ft. f.o.b. city 6" Pr Cl. 150	ASBESTOS CEMENT PIPE 12" Sew Cl. I	CLAY SEWER PIPE Per ft., delivered ASTM C13-55 24 in. 8 in.	CLAY SEWER PIPE ASTM C13-55 36 in. 12 in.	CLAY SEWER PIPE ASTM C200-55T 6 in. 24 in.	CLAY SEWER PIPE ASTM C200-55T 8 in. 36 in.	CLAY DRAIN TILE† Per 1,000 ft., car load lots, f.o.b. ASTM C4-55 6 in.	CLAY DRAIN TILE† 8 in.	CONCRETE SEWER PIPE§ Per ft., delivered ASTMC 14-55 12 in.	CONCRETE SEWER PIPE§ 24 in.
Atlanta	130.5	$1.64	$2.68	$.53	$.98	$....	$....	$334.00ry	....	$1.55m	$4.40m
Baltimore	140.4	1.64	2.46	.665	1.28	5.08s	12.71	187.80	$289.20	1.01	2.75m
Birmingham	125.8	1.64	2.68	.46	.86	3.70w	10.37w	260.00‡	440.00‡	1.25m	2.75
Boston	143.5	1.66	2.46	.826qrl	1.593qrl	6.615qrl	......	215.40r	330.60r	1.56mg	3.47mg
Chicago	140.9	1.64	2.46	.93m	1.78m	7.52m	21.16m	220.00n	330.00n	1.30	4.00
Cincinnati	135.5	1.66	2.55	.665l	1.2825l	4.905l	12.505	240.00	370.00	.85m	3.25m
Cleveland	141.7	1.66	2.55	.595s	1.1475s	4.725l	12.4025l	155.40m	240.60m	.85m	3.50m
Dallas	137.8	1.66	2.80	.439	.799	4.00b	9.17b	......	....	1.04	2.10
Denver	148.2	1.73	2.80	.47n	.84n	3.73n	......	......	....	.75m	2.75m
Detroit	142.1	1.66	2.55	.90n	1.70n	6.80n	18.50n	164.80m	254.20m	1.10	4.05
Kansas City	138.5	1.66	2.55	.61	1.105	4.47	11.56	275.00	485.00	.95	2.90
Los Angeles	148.6	1.73	2.46	.74l	1.61l	6.42l	15.36l	370.00l	530.00l	1.12	3.32f
Minneapolis	149.9	1.68	2.68	.86mo	1.55mo	6.70mo	......	......	....	2.13h	5.74h
Montreal	......	....	....	1.07u	1.90u	6.80u	12.50u	288.00	545.00	1.17h	3.11j
New Orleans	133.3	1.64	2.68	.528	.983	5.10	......	210.50p	468.00	.85	2.90
New York	138.7	1.66	2.46	1.02	1.94	7.56	19.48	......	....	1.50	3.00
Philadelphia	138.0	1.64	2.46	.68	1.31	5.13s	14.25s	300.00‡	350.00‡	1.75h	4.20h
Pittsburgh	142.9	1.66	2.46	.595m	1.15m	4.73m	12.40m	190.00	295.00	1.45z	3.50z
St. Louis	136.9	1.64	2.55	.59	1.08	4.45	10.80	180.00l	380.00l	1.45il	3.10hl
San Francisco	148.6	1.73	2.46	.78d	1.69d	6.72d	16.36d	320.00l	560.00l	1.05m	3.30m
Seattle	149.0	1.73	2.46	.67b	1.33b	6.84	......	220.00c	....	1.10k	3.25k
Toronto	....	....	....	.76	1.425	6.00	......	157.00	280.00	1.02	3.57

***WROUGHT STEEL PIPE**
(Full standard weight)
Discount from list; see footnote

Mill	2½ & 3 in., Butt Weld+ Black %	2½ & 3 in., Butt Weld+ Galv. %	3½ to 6 in., Lap Weld+ Black %	3½ to 6 in., Lap Weld+ Galv. %
Lorain, Ohio	16.75	0.50	......	......
Aliquippa, Pa	16.75	3.00	6.25a	+8.00a
Sparrows Pt., Md.	14.75	1.50	0.25a	+16.50
Benwood, W. Va	16.75	0.50	......	......
Youngstown, O.	16.75	0.50	6.25	+5.25a
Indiana Harbor, Ind.	15.75	0.50	10.50ab	+11.50a
Sharon, Pa.	16.75	0.50	......	......
Wheatland, Pa	16.75	0.50	6.25a	+10.50a
Etna, Pa	16.75	3.00	4.50d	+9.75d
Fontana, Calif.	3.25	+13.00	+7.25ab	+24.00ab

+Threaded and coupled. a 3½ to 4 in. b Continuous weld. 5 and 6 in. d 6 in.

*† Extra quality *§ extra strength. *‡ delivered. *a PRICE INDEXES for CENTRIFUGAL CAST IRON PIPE (Include carload freight allowed to city). These also serve as the HISTORICAL RECORD of THE $ PER NET TON PRICE of CLASS B, B&S, PIT CAST IRON PIPE. F.O.B. Foundry Price Indexes Birmingham, Ala., 125.8; Burlington, N. J., 134.6. *b Extra strength. *c 4-in., $130. *d SS361-A *e 30-in. *f 21 in. *g culvert pipe; reinf., ASTM C 75-56 *h reinf., ASTM C 75-54 *i reinf., ASTM C 76-54 *j centrispun; no standard specs. in Canada. *k 2% cash *l fob plant *m truck del. *n LCL del., fob truck *o listed price based on LCL (no min.) *p freight allowed to destination in city *q ASTM C 13-40 *r CL fob origin, freight allowed *s 1 ft lengths *t 3 ft lengths *u CESA A 60-1941 *v standard strength *w SS; add 20% for d.s. *x fob city

* WROUGHT STEEL PIPE: Deduct discounts shown above from the following standard list consumers carload prices to get mill price. List prices per ft. (*based on approx. $200 per net ton): Butt Weld ⅛ in., 5½¢; ¼ in., 6¢; ⅜ in., 6¢; ½ in., 8½¢; ¾ in., 11½¢; 1 in., 17¢; 1¼ in., 23¢; 1½ in., 27½¢; 2 in., 37¢; 2½ in., 58½¢; 3 in., 76½¢. Lap Weld 3½ in., 92¢; 4 in., $1.09; 5 in., $1.48; 6 in., $1.92. Add freight, 3% transport tax for destination price.

WROUGHT IRON PIPE: List prices per ft. same as for wrought steelpipe, but add following "discounts" to get Pittsburgh mill price: Butt Weld—1 in. black, + 65.54, galv., + 95.77; 1¼ in. black, + 66.54, galv. + 95.23, 1½ in. black, + 61.79 galv. + 91.22; Lap Weld—2½ in. to 3 in. black + 67.56 galv. + 95.77; 4½ in. to 6 in. black + 64.74 galv. + 90.68 Add freight rates plus 3% transportation tax to get destination price.

• Next Report: See ENR Nov 14

Materials Prices October Monthly Market Quotations by ENR Field Reporters

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

SOUTHERN PINE AND DOUGLAS FIR

All Southern Pine is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)

All Fir boards, dimensions, planks No. 2, Fir small timbers and timbers are No. 1. Lengths up to 20 ft. (Prices in italics)

LONG LEAF Y. P. Merchantable grade up to 20 ft.

PLYWOOD Rail freight increment (See note for base price)

	1x6 s4s	1x8 s4s	2x4 s4s	2x6 s4s	2x8 s4s	2x10 s4s	3x12 Rgh	6x12 Rgh	12x12 Rgh	Long Leaf 2x12 Rgh	Long Leaf 12x12 Rgh	Plywood 5/8"	Plywood 3/4"
Atlanta †	**$73.00**	**$78.00**	**$76.00**	**$79.00**	**$81.00**	**$86.00**	**$136.00**	......	......	$121.00	$156.00	$22.32	$27.24
Baltimore *	**92.00**	**96.00**	**96.00**	**98.00**	**98.00**	**102.00**	**114.00**	......	......	170.00	185.00	25.92	31.60
	97.50g	*108.00g*	*123.00g*	*123.00g*	*123.00g*	*123.00g*	*133.00g*	*$144.00*	*$144.00*				
Birmingham †	**87.00**	**89.00**	**82.00**	**89.00**	**92.00**	**97.00**	**112.00**	......	......	115.00	160.00	21.78	26.58
	108.50	*108.50*	*105.00*	*108.00*	*108.00*	*113.00*	*111.50*	*108.50*	*108.50*	......	......	......	......
Boston 3	**98.00f**	**98.00f**	**106.00f**	**106.00f**	**106.00f**	**115.00a**	......	......	......	......	......	25.92	31.60
	96.00k	*96.00k*	*113.00*	*113.00*	*113.00*	*119.00*	*124.00*	*129.00*	*133.00*				
Chicago **	**94.00**	**97.00**	**91.00**	**105.00**	**113.00**	**114.00**	**109.00**	......	......	137.00	137.00	22.45	27.37
	104.00	*104.00*	*117.00*	*115.00*	*115.00*	*116.00*	*124.00*	*124.00*	*124.00*				
Cincinnati *	**96.00**	**97.25**	**87.00**	**93.25**	**98.00**	**106.00**	**119.50**	......	......	143.75	141.75	25.00	30.48
	100.25	*101.50*	*106.00*	*108.00*	*109.00*	*112.50*	*134.00*	*134.00*	*134.00*	......	......	......	......
Cleveland **	**92.00**	**93.00**	**97.00**	**95.00**	**95.00**	**95.00**	......	......	......	......	......	25.37	30.93
	......	......	*114.00*	*106.00*	*106.00*	*106.00*	*136.00*	*136.00*	*136.00*				
Dallas k‡	**70.00**	**70.00**	**65.00**	**65.00**	**65.00**	**70.00**	**140.00**	......	......	138.00	130.00	18.72	22.80
Denver *	*Not in stock*		*122.50*	*122.50*	*122.50*	*127.00*	*141.50*	*148.50*	*153.80*	......	......	13.92	16.98
Detroit ‡	**116.50**	**119.50**	**114.00**	**117.00**	**122.00**	**122.00**	......	......	......	130.00	......	25.00	30.48
	125.00	*125.00*	*130.00*	*132.50*	*130.00*	*135.00*	*185.00*	*195.00*	*195.00*	......	......	......	......
Kansas City 3	**120.00**	**120.00**	**120.00**	**120.00**	**125.00**	**135.00**	......	......	......	......	......	16.56	20.16
	120.00	*120.00*	*120.00*	*120.00*	*125.00*	*130.00*	*150.00*	*225.00*	*225.00*	......	......	......	......
Los Angeles 1	*95.00*	*95.00*	*95.00*	*95.00*	*95.00*	*95.00*	*119.00*	*120.00*	*130.00*	......	......	16.61ab	20.25ab
Minneapolis #	*135.00m*	*135.00m*	*140.00*	*140.00*	*140.00*	*140.00*	*185.00*	*185.00*	*185.00*			19.89	24.25
Montreal ab	**92.00**	**100.00**	**92.00**	**93.00**	**110.00**	**128.00**	......	......	......	125.00	125.00	......	......
	178.00	*178.00*	*178.00*	*178.00*	*178.00*	*178.00*	*171.00*	*171.00*	*171.00*	......	......	......	......
New Orleans †	**87.00**	**87.00**	**94.00**	**91.00**	**90.00**	**97.00**	**121.50**	......	......	151.00	151.00	18.72	22.80
†	*110.00*	*110.00*	*104.50*	*120.00*	*120.00*	*120.00*	*132.50*	*132.50*	*152.50*	......	......	......	......
New York 3	**108.00**	**109.00**	**115.00**	**117.00**	**117.00**	**121.00**		......	......	240.00	255.00	25.92	31.60
	......	......	*117.00*	*120.00*	*121.00*	*122.00*	*165.00*	*165.00*	*165.00*	......	......	......	......
Philadelphia ‡		**Range from 109/129**				**112/132**	**133/155**	......	......	214/224	214/224	28.00	32.00
		Range from 120/150				*131/163*	*136/158*	*165.00*	*165.00*	......	......	......	......
Pittsburgh 2	**130.00**	**130.00**	**125.00**	**125.00**	**130.00**	**135.00**	......	......	......	180.00	......	25.92	31.60
	140.00	*140.00*	*145.00*	*140.00*	*145.00*	*145.00*	*180.00*	*200.00*	*210.00*	......	......	......	......
St. Louis #	**118.00**	**120.00**	**128.00d**	**128.00d**	**128.00e**	**133.00e**	......	......	......	......	......	18.72	22.80
	......	......	*137.00*	*137.00e*	*137.00e*	*141.00e*	*195.00e*	*195.00*	*195.00*	......	......	......	......
San Francisco 1	*73.00*	*73.00*	*80.00*	*82.00*	*80.00*	*80.00*	*105.00*	*115.00*	*115.00*	......	......	12.22	14.91a
Seattle †	*67.00*	*72.00*	*73.00*	*73.00*	*73.00*	*74.00*	*85.00*	*90.00*	*90.00*	......	......	......	......
Toronto a	**91.00**	**95.00**	**90.00**	**91.00**	**91.00**	**91.00**	......	......	......	93.00	......	......	......
	114.00	*114.00*	*120.00*	*122.00*	*126.00*	*130.00*	*145.00*	*140.00*	*150.00*	......	......	......	......

† F.o.b. mill. * F.o.b. city, CL, out of yard. ** F.o.b. city, CL, direct mill shipment. ‡ Deliv. to contr. CL. 1. Retail, LCL, at yard. # Retail, LCL, deliv. 2. Deliv. truck lots. 3. asd., truckload lots, 5/6 Mftbm

LUMBER: Bold Face Type, Southern Pine. Italics, Douglas Fir. *a Spruce. *b Tax exempt. *c 5M lots. *d 8, 10, & 12 ft. lengths. *e 8 to 18 ft. lengths. *f Hemlock *g No. 1 common. *j 8 ft. lengths. *k No. 3 common. *l Incl rail rate from North west mills to San Francisco are $11.50 to $15.00 per M ft. bm. From Northern Calif. mills $9.00 by rail, $9.50 by truck. All rates for surfaced stock. For rough, add $3.00 to above figures. *m Up to 16"

PLYWOOD (Plyform, oiled and edge sealed): Douglas fir, 4' x 8' panels, 5-ply sanded 2 sides, carload lots, delivered per 1000 sq. ft. surface. Seattle base price, Interior, moisture resistant, 5/8", $146.00; 3/4", $166.00. Exterior, waterproof, 5/8" $150.00; 3/4", $170.00. For other centers add rail freight increment from table on proper size. *a Lower rate by water shipment. *b 50,000 lbs. minimum.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS Discounts from jobbers list, Feb. 1, 1950a Single or Double Strength A quality	B quality	EXPLOSIVES Per lb. 40% Ammonia Gelatin in 50 lb. cases delivered in 200 lb. lots*
Atlanta	78%c	78%e	$0.2615
Baltimore	74%d	76%d	.2615
Birmingham	82%	83%	.2065
Boston	72–10%	72–10%	.2615
Chicago	72%	72%	.2615
Cincinnati	74%	74%	.2615
Cleveland	74–2–10%	74–2–10%	.3015
Dallas	76%	76%	.2690
Denver	73%	73%	.2665
Detroit	74–10–10%	74–10–10%	.2615
Kansas City	76–10–10%	76–10–10%	.2665
Los Angeles	70%	76%e	.2640
Minneapolis	71–10%	71–10%	.2665
Montreal	40–10–5%bc	40–10–5%b	22.05h
New Orleans	75%	76%	.2665
New York	79–10%	79–10%	45g
Philadelphia	74–10%	76–10%	.2615
Pittsburgh	72%	72%	2615
St. Louis	72–10–10%	72–10–10%	2665
San Francisco	60%–25%	68%–25%	.2615
Seattle	67%	72%	2640

Price of 60% Ammonia Gelatin is $0.15 per lb. higher than 40% in U. S., $1.75 per 100 lbs. higher in Canada.

Glass: *a Jobbers' list price per box, 14 x 20, ss, $42.75 for A quality, $37.50 for B quality; 14 x 20, ds, $60.00 for A quality $52.75 for B quality. *b sales tax extra. *c 77% for single strength *d Discount 6/15/52. *e 77% for double strength

Explosives: * Cartridges of 1¼", 1½", 1¾", 2", 2¼", 2½", 3" diameters. Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas. *g In borough of Kings, Queens, and Richmond and in Manhattan south of Canal St., add delivery charge of $20.00 per trip. *h F.o.b Beloeil (near Montreal), per 100 lb. forcite, 40%. Forcite 60%, $23.80

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.2065	$0.2465	$0.2615
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.2115	.2515	.2665
Rocky Mtn. States	.2115	.2515	.2665
Pacific N. W. States	.2090	.2490	.2640
Pacific S. W. States	.2065	.2465	.2615

- Next Report: See ENR Oct 24

PILES, TIES F.O.B.

PILES

Prices per linear foot, fir and pine, bark off, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail Pine*	By Rail Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.51	....
12-in.—2-ft. from butt	6-in.	50 to 59-ft.	.54	....
12-in.—2-ft. from butt	6-in.	60 to 69-ft.	.58	....
12-in.—2-ft. from butt	6-in.	90 to 100-ft.	....	....
13-in.—3-ft. from butt	5-in.	91 to 100-ft.	....	....
14-in.—2-ft. from butt	6-in.	60 to 69-ft.	.60/.68	....
14-in.—2-ft. from butt	6-in.	70 to 79-ft.	.75/.83	.93
14-in.—2-ft. from butt	5-in.	80 to 85-ft.	.83/.93	.94
14-in.—2-ft. from butt	5-in.	85 to 89-ft.	....	1.00
14-in.—2-ft. from butt	5-in.	90 to 100-ft.	....	1.03

* Pine piling over 80-ft. available only in limited quantities

RAILWAY TIES

Prices f.o.b. per tie for carload lots:

		6" x 8" x 8' Untr.	6" x 8" x 8' Tr.	7" x 9" x 8'6" Untr.	7" x 9" x 8'6" Tr.
Birmingham*	Hardwood, Grade 3	$1.70	$2.55	Gr. 5 $2.25	$3.33
	Grade 2	1.50	2.35	" 4 2.10	3.18
	Grade 1	1.15	2.00	" 3a 1.70	2.78
Chicago	Red Oak	......	4.15a	......	4.75a
New York	S. L. Sap Pine	2.00d	4.00d	3.00g	6.00g
	Mixed Oak	2.50d	4.50d	3.50g	6.50g
Philadelphia	Red Oak	2.95/3.15	4.50/4.70	3.60/3.80	5.50/5.75
St. Louis	White Oak	2.65	......	2.95h	......
	Red Oak	2.55	3.40a	2.80h	3.60a
San Francisco	Douglas Fir	2.03ef	2.96ef	2.84bef	4.31caf

Tr.—Treated; Untr.—Untreated. a Creosoted. b 7" x 9" x 8'. c Empty cell d 6 x 8 x 8'6" e Green. f f.o.b. cars. g 7 x 9 x 8'6" * Add 75¢/tie freight charge to Birmingham. *h 7" x 9" x 9½" g

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder in drums f.o.b. works, per 100 lb	$5.02
Chlorine cylinders, liquid, per lb. f.o.b. works	.103
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, f.o.b. works, ton	29.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb	2.30
Soda ash, 58%, in paper bags, per 100 lb. dense	1.70
Sulphate of aluminum, commercial, in 100-lb. bags f.o.b. works	1.85
Sulphate of copper, in bags, 99% per 100 lb. f.o.b. works	14.90

PUT YOUR PIPE JOB AHEAD 3 WAYS with

UNITED STATES Concrete Pipe

THE UNITED STATES
CONCRETE PIPE CO.

Prompt, trench side deliveries of UNITED STATES Concrete Pipe from our Ft. Lauderdale, Fla., plant helped keep this Miami, Fla., job "on schedule."

ENGINEERS: Rader & Associates, Consulting Engineers, Miami, Florida.

CONTRACTOR: R. E. Vaughan, Inc., Miami, Florida.

PIPE: 24" Reinforced United States Concrete Pipe, manufactured at Ft. Lauderdale, Florida.

If you are planning sewerage and drainage construction anywhere in the area we serve, you can put your project *ahead* three ways by using UNITED STATES Concrete Pipe.

Here's why . . .

PROMPT SERVICE—Five concrete pipe plants and sales offices (see addresses below) assure prompt deliveries to the job site, helping to keep pipe work "on schedule."

FULL LINE—You are sure of meeting your *entire* pipe requirements at "United States" . . . We furnish Concrete Sewer and Culvert Pipe from 6" to 108", Fittings, Vitrified Clay Plate-Lined Concrete Pipe, Pre-cast Manholes and TYLOX Flexible Couplings.

TOP QUALITY—"United States" Concrete Pipe is of highest quality obtainable, yet the initial cost is low . . . a result of nearly half a century of pipe-making experience, combined with our continuing program of keeping plants, production methods *and* equipment "up to the minute" in efficiency. Arrange now for UNITED STATES Concrete Pipe on your next project and put the job ahead three ways.

6047

UNITED STATES CONCRETE PIPE CO.

UNIVERSAL SEWER PIPE CORPORATION

PRODUCTS

Vitrified Clay Pipe and Fittings, Concrete Pipe, Vitrified Clay Liner Plates, Ship Lap Wall Coping and other Clay Products.

SALES OFFICES

Baltimore 27, Md.—Halethorpe Branch, Box 7428 .... Tel. CI-2-7400
Philadelphia, Pa. .... Tel. EN-6015
Bristol, Pa., Box 30 .... Tel. ST-8-5571
Cincinnati 44, Ohio, Box 397 .... Tel. LO-1-7846
Ft. Lauderdale, Fla., Box 958 .... Tel. JA-4-8461

GENERAL OFFICES • 1500 Union Commerce Bldg. • Cleveland 14, Ohio • Tel. Main 1-5240

Materials Prices September Monthly Market Quotations by ENR Field Reporters

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over,			BRICK Per M. in quantity		LIME Per ton, in paper, Carload lot,		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Hydrated finishing	Common hydrated	Pulverized*P* or lump
Atlanta	$149.90p	$149.90p	$299.80p	$334.55p	......	......	$30.50p	$32.70p	$23.50	$24.50	$.....
Baltimore	203.00	217.00	406.00	485.50	596.00	681.00	36.00k	41.00k	33.00	22.00	......
Birmingham	135.00p	152.00p	......	303.00p	376.00p	465.00p	27.00ff	38.00gg	35.02	22.30	26.33*B*
Boston	220.75†	235.56†	441.75†	529.50†	......	......	41.50p	46.50p	39.20†	31.20†	.....
Chicago	135.00	145.00	280.00	......	......	......	30.00	32.00	38.00	35.20e	.....
Cincinnati	205.00j	225.00j	296.00jdd	213.00j	288.00j	314.00j	45.75j	47.00j	30.04j	26.04j	30.04j
Cleveland	209.00	223.00	......	475.00	......	......	43.00	47.00	31.00	25.00	.....
Dallas	152.00	152.00	300.00	364.50	446.25	552.50	26.75	45.00	41.60	25.08	27.65
Denver	......	......	......	......	......	......	31.50	47.50	46.00p	42.00p	46.00p
Detroit	273.00	298.00	545.00	......	662.00	755.00	47.50p	48.00p	38.00	30.00	.....
Kansas City	158.00	158.00	312.00	312.00	400.00	500.00	33.00	33.00	36.26	34.26	29.76
Los Angeles	r	r	r	r	r	r	32.50§	......	38.00	38.00	39.00
Minneapolis	188.00p	210.00p	429.00p	210.00pw	......	......	43.00vp	52.50ii	46.00bbe	36.00bbe	48.00bbde
Montreal	170.00au	178.00au	325.00aus	270.00q	400.00q	......	42.00*C*	49.00*C*	39.00	22.00	13.25
New Orleans	186.00	186.00	380.00	380.00	......	......	40.00	55.00	44.00	32.00	32.00*P*
New York	158.10h	168.60h	231.70ch	233.90hn	......	......	44.00	......	37.00	35.00	.....
Philadelphia	169.00	180.20	337.90	405.00	......	......	30/34	38/42	27.60	25.60	3.17m
Pittsburgh	147.50*A*	157.75*A*	295.00*A*	335.00*A*	435.00*A*	500.00*A*	39.00*A*	46.00*A*	32.00*A*	28.00*A*	.....
St. Louis	178.50o	185.00p	391.00p	401.00p	459.00	621.50	43.00l	41.50	0.95aa	.80aa	1.35z
San Francisco	156.85*	177.10*	235.30dd*	......	......	......	42.50*	42.50*	27.75	27.75	30.50i
Seattle	225.00p	250.00p	450.00p	250.00pw	......	......	43.00	57.00	52.00bb	40.00bb	4.50mbb
Toronto	146.00	157.00	289.00	234.00f	395.00	......	30.00	63.00	36.00	33.50	31.50

§ F.o.b. yard. •* F.o.b. plant Stockton. •† F.o.b. yard Roxbury. •a Smooth. •b Per 50 lb bags. •c 6 x 12 x 12 in.-3 cell. •d Pulverized hot. •e 5%, 10th following month. •f 8 x 8 x 12. •g 5½ x 8 x 12. •h F.o.b. trucks, job site N.Y.C. •i 60-lb. sacks. •j Truck load or over. •k $1.00 discount. •l Red face. •m Per bbl., 180 lb. processed. •n 7¾ x 7¾ x 12. Speed tile. •o mason's double hydrated pressure. •p Truck lots. •q Provincial and Municipal tax extra. •r Not used; earthquake danger. •s 8 x 16 x 12. •t 5½ x 8 x 11¼. •u Incl. Federal tax. •v Sand lime. •w 5 x 8 x 12. •y Stacked. •z Pebble; 80 lb. sack. •aa 50 lb. sack. •bb LCL. •dd 6 x 12 x 12. •ff 80% common. •gg Rough. $40.00 Smooth. •ii Chi common. •A 2% cash. •B lumps, $26.72 •C $4.50 for del.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 800-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in 100 lb. cases In oil *w*	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES; Carload lots f.o.b. factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar-pitch 380 lb. bbl. per ton
Atlanta	$16.50	$30.125	$3.59	$3.86	$3.31	$3.39	$2.20	$2.62	$0.67	$57.75
Baltimore	16.25	29.75	3.00	4.40	3.50	2.78	4.25	4.25	.48	50.18
Birmingham	16.50	30.125	3.90	3.40	....	3.09	2.29ii	2.29ii	.82ff	45.00ee
Boston	16.25	29.75	....	....	....	3.63g q	2.83sg	2.83sg	.50q	58.00q
Chicago	16.25	29.75	....	....	....	3.69‡u	2.98‡o	2.98‡s	46.00‡bbe	55.70‡
Cincinnati	16.25	29.75	....	....	....	3.13	2.70	2.73	.428y	55.96
Cleveland	16.25	29.75	2.40ggg	2.60gg	2.80gg	3.73q	2.85o	2.85o	.501y	47.00gg
Dallas	16.50	30.50	....	3.13*B*	....	3.00u	3.00o	3.00o	.464	65.00hh
Denver	16.75	30.25	3.29	5.15	3.04	2.89	2.10o	2.40o	.48ff	50.00
Detroit	16.25	29.75	2.70	3.95	2.70	3.30	2.54f	2.409f	.58‡ff	47.30
Kansas City	16.25	30.50	3.94	3.38	2.96	3.71ii	2.85o	2.85o	.684y	......
Los Angeles	16.25	30.00	3.30n	4.50n	4.20n	3.20n	2.15on	l	.70ny	l
Minneapolis	16.25	29.88/29.75	....	....	....	2.99	2.41hi	2.41hi	.442i	50.00r
Montreal	......	......	5.02*D*fft	5.94*E*fft	4.65*F*fft	5.40	4.65f	4.65f	1.60	....
New Orleans	......	......	....	....	....	2.74	2.18	2.43	0.689	....
New York	16.25*C*	29.75	....	....	....	3.19	2.45o	2.45o	.425s	49.00*
Philadelphia	16.25	29.75	3.60	3.40/3.65	3.50/4.60	3.00/3.30	2.54o	2.54o	.37/.45	48/54
Pittsburgh	16.25	29.75	2.10#*G*	2.25#*H*	2.25#*I*	3.37s	2.59s	......	.45	......
St. Louis	16.25	29.75	....	....	....	3.70iis	2.75hh	2.75hh	.46y	64.00
San Francisco	16.25	30.00	3.20	4.30	3.50	2.69	2.09aa	3.10	.47jj	54.00
Seattle	16.25	30.25	3.47ee	4.19ee	....	3.72qee	3.22hee	....	.50ee	47.20ee
Toronto	....		....	....	....	4.45	4.10e	4.65o	1.70j	88.00*A*

•‡ Delivered. • Note: Red lead in oil 50¢ higher than white lead in oil. •* Aver. wt. approx. 425 to 550 lbs drums. •a Red lead prices change frequently due to pig lead price changes. •b U. S. War Dept. Spec 3-49A. •c ASTM Spec. D266-31. •d 80% minimum ferric oxide. •e 15 lb. •f Per 432 sq. ft. •g F.o.b. yard, Roxbury. •h Per roll, 65 lb. •i Net carload lot prices; Minneapolis and vicinity. •j 45 gal containers. •k Per cwt. •l Not used. •n F.o.b. city. •o Per 60-lb. roll. •p 6-drum, 50 gal. ea. •q Per 90-lb. roll. •r F.o.b. factory, Chicago. •s Truckload. •t Incl. Federal tax. •u Per 90-lb. square. •v Per ton. •w Price to contractors $1.25 less. •x Mineral surfaced. •y 55-gallon container. •z Drums. •aa 15 lb., 324 sq ft roll. •bb Roofers coating and cement; •cc LCL, truck delivery. •ee Asphalt pitch in 100 lb. package. •ff 5-gal. drums. •gg F.o.b. factory. •hh Incl. freight. •ii Per roll. •jj Asbestos roof coating. •A 400 lb barrels. •B ASTM Spec D-662-49 •C 95%. •D Std. Black. •E Ready-mixed. •F Over 80% ferric oxide. •# Milt. Spec: G, TTP27; H, TTV81; I, TTP31.

PLASTER, VERMICULITE AND METAL BUILDING SHEETS & TUBING

	PLASTER‡ Neat per ton	Gauging per ton	VERMICULITE‡ Home Insulation pellets	Plaster aggregate	Concrete Aggregate Untreated	PERLITE‡ Plaster Aggregate	Concrete Aggregate Untreated	ALUMINUM SHEETh† Flat .102" th 36"x96" & 48"x144" per lbjt	Corr roof .032" th 35"x12' per shu	STAINLESS STEEL† SHEET-TYPE 302g 20 ga 48"x96-120" per cwthh	28 ga 36"x120" per cwtmm	COPPER WATER* TUBING-TYPE L 2000 ft lots per ft ½"b	⅝"c
			per bag of 4 cu ft										
Atlanta	$31.00	$36.00	$1.55s	$1.65s	$1.80d	$1.65	$1.65	$0.422n	$8.97n	$61.44n	$67.50	$16.74f	$23.41f
Baltimore	23.25	33.65	0.95	1.15	1.15	1.15	1.65	0.431	0.480r	56.25	64.25	0.1674	0.2341
Birmingham	33.00	39.00	1.55	1.55	1.80l	1.55	1.55	0.466	10.02	67.34	76.09	0.1608	0.2249
Boston	22.00	30.00	1.40	1.40	1.45	1.45	1.50	0.446	28.50p	65.39dd	71.84ddff	0.1608	0.2249
Chicago	26.80	26.80	1.55	1.60	1.60l	1.50	1.50	0.506x	10.376a	65.15aee	73.90aee	0.1608	0.2249
Cincinnati	28.00*	28.00*	1.75	1.75	1.75	1.85	1.90	0.434	9.56	65.03	71.28ff	0.1591	0.1911
Cleveland	26.50	43.00	1.13k	1.16ii	1.24l	1.45	1.45	0.506aa	8.66	67.83	76.58	16.08f	22.49f
Dallas	30.00	32.00	1.05	1.21	1.37l	1.21	1.32	0.474	0.5100r	66.59	80.00	0.200	0.2810
Denver	25.00	25.00	1.50	1.40	1.50	1.40	1.55	0.462	10.18	66.30gg	74.80gg	0.2006	0.2810
Detroit	25.00	25.00	1.28	1.32	1.41	1.45	1.45	0.456a	10.376a	65.15a	73.90a	13.30f	24.78f
Kansas City	30.00	35.00	1.29	1.45	1.48l	1.40	....	0.444	11.40	67.50	76.25	16.08f	22.49f
Los Angeles	26.20	27.20	1.25k	1.15k	1.25	.95	1.10	0.506	10.543d	67.10	75.85	0.1674	0.2341
Minneapolis	32.00	32.00	1.55	1.60	1.80	1.40	1.40	0.503	14.25w	66.21	74.71ff	0.1556	0.2171
Montreal	27.60oo	35.60oo	1.20	1.40	1.50	1.15s	1.15s	0.437	9.92	66.50	......	0.228	0.287
New Orleans	32.00	45.00	1.25	1.25	1.25	1.25	1.25	0.464	8.303	62.04	70.54	0.1899	0.2558
New York	24.00	30.00	1.35	1.30	1.50	1.40	1.40	0.501a	10.14ad	68.58	77.33	15.56f	21.71f
Philadelphia	23/25	32.00	1.35	1.35	1.40l	1.05	1.05	0.44aw	9.46a	66/68a	75/77a	20.00f	26.00f
Pittsburgh	28.00nn	28.00nn	1.60nn	1.50nn	1.35	1.50	1.65	0.456	9.8	63.41	76.18	0.1403	0.1768
St. Louis	29.00	40.00	1.35	1.60jj	1.55	1.60	1.60	0.492	10.37	70.86	77.36y	16.08fm	22.49fm
San Francisco	27.85	32.00	1.20	1.20	1.30	1.20	1.30	0.505	9.13	64.95	73.45	0.1608	0.2949
Seattle	41.00	44.00	1.45	1.25k	1.85l	1.50k	....	0.506	9.964	63.00	83.00	0.1608	0.2249
Toronto	28.50	45.50	1.20	1.30	1.45l	....	1.55	0.4095	24.00ae	73.74	86.52	0.2768	0.3347p

‡ trucklots, delivered †fob warehouse *fob city •a delivered •b ½" O.D. •c ⅝" O.D. •d 0.100"th •e 34" x 60" sheet •f per 100 ft •g 5 tons & up: cold roll, anneal & pickled; 2B finish •h 15M lb lots •j 1100 & 3003 alloy, mill finish •k bag of 3 cu ft •l treated with air entraining agent •m 2-10M ft •n fob mill, fr allow •p 100 sq ft •r per lb •s 30 lb bag •t 36" x 96;-10.81 lb/sh; 48" x 144"; 21.7 lb/sh •u 19.31 lb/sh •v fob plant •w 48" x 144" •x 100th •y 27 gauge •aa 16M lb & up •dd add $0.75 cwt boxing •ee 4 tons & up •ff 26 ga •gg add $2 cwt boxing; $0.75/cwt on skids •hh Theoretical wt for 48" × 96"; 80.4-lb, per sh. •ii 300-bag lots •jj 100-lb bag •mm Theoretical wt: 19.7 lb per sh. •nn 2% cash •oo Incl. Federal tax.

• Next Report: See ENR Oct 31

Materials and Labor Prices

October Monthly Market Quotations by ENR Field Reporters

BUILDING BOARD & LATH AND INSULATION—DELIVERED TRUCKLOAD LOTS

	GYPSUM PLASTER BOARD tapered edge per Msq ft ½″	GYPSUM PLASTER BOARD tapered edge per Msq ft ⅝″	GYPSUM BOARD LATH plain or perf per Msq ft ⅜″ x 16″ x 48″	GYPSUM SHEATHING tongue & groove per Msq ft ½″ x 2′ x 8′	FIBER BOARD SHEATHING asph impreg & coat per Msq ft ½″ sq ed	FIBER BOARD SHEATHING asph impreg & coat per Msq ft 25/32″ T&G	FIBER BOARD INSULATION sq edge, paint per Msq ft ½″	MINERAL WOOL INSULATION† loose, per 40-lb bag a	MINERAL WOOL INSULATION† 3″ batts per M sf	GLASS FIBER INSULATION† loose, per 40-lb bag a	GLASS FIBER INSULATION† 3″ batts per M sf	ALUMINUM FOIL 80# Kraft 1 side foil per roll of 250 s. f.	ALUMINUM FOIL Expansible Blanket 2 layers foil per Msq.ft
Atlanta	$70.00	$60.00	$43.50	$70.00	$70.00	$127.00	$70.00	$1.00	$60.00	$2.00b	$75.00	.....	.....
Baltimore	51.25f	44.75f	32.55f	55.00f	65.00f	108.50f	69.00f	1.30	66.50	1.50	45.00	$4.00g	$33.50
Birmingham	73.00	60.00	47.77	75.00	82.00	136.50	81.00	1.40	70.00	1.60	75.00	3.13g	.....
Boston	60.00m	50.00m	36.00m	60.00m	65.00m	120.00m	79.00hn	1.45	75.00	....	60.00	5.30	52.50
Chicago	67.00	52.00	43.00	62.00	85.00	123.00	85.00	1.85	80.00k	..	63/65l	5.25g	....
Cincinnati	48.00w	42.85w	32.05w	51.16w	70.00w	125.00w	72.50w	1.30	63.00	1.30	76.50	3.12j	50.00
Cleveland	60.50	55.00	40.00	65.00	74.00	130.00	80.00	1.35/1.50	80.00	....	62.75*	20.00o	60.00
Dallas	58.00	55.00	42.50	65.00	73.50	122.50	70.00	1.92	66.00	1.40	66.10	4.30g	.....
Denver	62.00	54.50	41.00	62.00	75.90	126.00	74.90	....	71.00u	1.28s	75.00bb	11.00r	21.00
Detroit	57.50	49.50	36.00	61.00	59.50	90.00	59.00	....	.....	1.95b	83.00	....	...
Kansas City	65.00	55.00	40.00	.....	72.00	115.00	75.00	1.40	75.00	2.00	75.00	4.10d	44.10t
Los Angeles	64.00	59.00	0.225x	66.50	71.87	121.25	80.00	....	83.00	1.35s	64.00	4.40g	.....
Minneapolis	75.00	65.00	0.40x	80.00	78.00	140.00	78.00	2.00	80.00	1.80	80.00	5.50	.....
Montreal	56.00	47.40	36/39	53.00	63.25	......	63.00	1.50	66.00	1.50	66.00	9.00q	56.00
New Orleans	57.00	48.00	45.00	60.00	75.00	125.00	72.50	1.75	65.00*	....	.....	.....	.....
New York	53.00	45.50	35.00	54.00	71.00	117.00	72.50	1.55b	68.50	1.55b	68.50	4.05i	52.50aa
Philadelphia	50.55	48.53	34.40	49.54	68.73	105/110	55/65	....	60/70	....	70/75	5.60/6.34	40/50
Pittsburgh	.....	47.50	35.00	.....	60.00	100.00	55.00	1.05s	55.00s	1.05s	55.00s	2.75i	38.50
St. Louis	65.00	55.00	39.00	70.00	75.00	120.00	80.00	1.35	85.00	1.65	66.00	4.50i	.....
San Francisco	55.00	46.50	0.35x	58.00	68.00	109.00	67.00	1.60	66.50	1.60	66.50	4.95	55.00
Seattle	66.00	57.50	49.45	65.00	74.50	125.00	73.50	1.60y	74.00	1.60*z	50.00*l	4.25	46.50
Toronto	61.00	50.00	38.00	64.50	75.00	......	......	1.40	60.00	...	60.00	16.00e	45.45

•* fob warehouse. •a for hand packing. •b 30# bag. •c 2-side foil. •d 40# kraft paper, 5 Msf, 100/500 rolls. •e 20# sq ft bag, 4″ thick. •f full trailer loads. •g 80# kraft paper backing. •h LCL. •i 40#. •j 80#. •k 7″. •l 2″. •m 10 ton quantities. •n distributor's siding. •o per Msf roll. •p per sf. •q 500 sf. •r per cwt. •s 35# bag. •t Insufoil. •u flame proof $75 •w fob city. •x sq yd. •y 26# bag. •z 32# bag •aa 12″ to 24″ width. •bb semi-thick

HOURLY WAGE RATES—Base rate + fringe benefits

	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Electrical Workers	Steamfitters	Common Labor Building	Common Labor Heavy Const
Atlanta	$3.45	$2.90	$3.15+7½¢[d]	$3.225	$3.125	$3.30+7¢[p]	$3.30+25¢[d]	$1.55	$1.55
Baltimore	3.80+10¢[d]	3.05+7½¢[d]	3.65+7½¢[d]	3.55/3.70+10¢[Q]	3.35+7½¢[d]	3.425	3.30+7½¢[d]	1.90+7½¢[d]	1.90+7½¢[d]
Birmingham	3.50	2.70	3.20+10¢[i]	2.65[r]	3.05	3.30	3.32+10¢[i]	1.50	1.60
Boston	3.65+15¢[d]	3.25+10¢[d]	3.70+20¢[e]	3.65+10¢[J]	3.30+13¢[R]	3.25+25¢[S]	2.45+7¢[d]	2.45+7¢[d]	2.35+7¢[d]
Chicago	3.82½+7½¢[i]	3.45+20¢[o]	3.80+15¢[i]	3.40+5¢[i]	3.70+23¢[i]	3.65+22¢[i]	3.55+22¢[aa]	2.77½+7½¢[i]	2.77½+7½¢[i]
Cincinnati	3.75	3.45	3.50+7½¢[d]	3.225/3.475	3.50	3.67+4¢[N]	3.65+9½¢[g]	2.50	2.40
Cleveland	3.715+10¢[i]	3.74	3.64+10¢[i]	3.74	3.74	3.765	3.64+10¢[d]	3.00	2.915
Dallas	3.775	3.10	3.125+7½¢[i]	3.20	3.50+10¢[i]	3.25+7½¢[i]	3.25+7½¢[i]	1.62½	1.62½
Denver	3.75	3.20	3.125+7½¢[d]	2.95	3.375+12½¢[hh]	3.40[l]	3.35+15¢[D]	2.10	2.10
Detroit	3.53+38¢[H]	3.25+40¢[q]	3.60+22½¢[P]	3.20+20¢[s]	3.58+34¢[ol]	3.65+34½¢[C]	3.63+14¢[B]	2.58+15¢[s]	2.58+15¢[s]
Kansas City	3.75	3.125	3.20	3.22	3.50	3.475[O]	3.40+9¢[W]	2.255	2.305
Los Angeles	3.80+10¢[bb]	3.22½+10¢[d]	3.625+10¢[i]	3.19+10¢[d]	3.94+15¢[d]	3.90[i]	3.70+19¢[T]	2.50+7½¢[i]	2.50+7½¢[i]
Minneapolis	3.575	3.15	3.32	3.10	3.25+23¢[G]	3.25+36¢[n]	3.215+20¢[e]	2.40	2.40
New Orleans	3.325+5¢[i]	2.85	3.20+7½¢[i]	2.925+7½¢[i]	2.985+5¢[i]	3.275+7½¢[i]	3.15+15¢[i]	1.60	1.60
New York	4.25+37¢[br]	3.90+31¢[bJ]	4.30+36¢[p]	4.15+33¢[ii]	4.15+50¢[A]	3.65+40¢[aF]	4.10+41¢[bL]	2.80+22¢[V]	2.80+22¢[V]
Philadelphia	3.75+17¢[i]	3.535	4.05+18¢[M]	3.20½/3.95½+10¢[i]	3.90+15¢[i]	4.07½+16¢[u]	4.00+11½[i]	2.25	2.55
Pittsburgh	3.95+17½¢[m]	3.525+7½¢[i]	3.80+10¢[d]	3.42+10¢[d]	3.575+17½¢[m]	4.00+28¢[d]	3.775+17½¢[m]	2.325+17½¢[m]	2.20+15¢[ff]
St. Louis	3.75+28½[c]	3.35+10¢[i]	3.37+7½¢[i]	3.45[f]	3.675+7½¢[i]	3.75+26¢[c]	3.70+20¢[i]	2.40+10¢[i]	2.40+10¢[i]
San Francisco	3.95+52½¢[dd]	3.175+30¢[f]	3.62½+10¢[i]	3.205+10¢[i]	3.61+20¢[w]	3.525+26¢[U]	3.70+46¢[K]	2.505+10¢[i]	2.505+10¢[i]
Seattle	3.75+10¢[d]	2.94+10¢[d]	3.25+10¢[d]	3.13+20¢[y]	3.40+10¢[d]	3.40+21½¢[X]	3.40+23¢[T]	2.51+10¢[d]	2.51+10¢[d]
Montreal	2.20+16¢†	2.00+16¢†	2.15+16¢†	1.90+15¢†	2.22+19¢†	2.20+18¢†	2.22+18¢†	1.40+10¢†	1.40+10¢†
Toronto	2.76+11¢[l]	2.50+10¢[l]	2.50+10¢[l]	2.60+10¢[l]	2.60+20¢[ii]	2.80+11¢[l]	2.49+16¢[ii]	1.55+6¢[l]	1.55+6¢[l]

ENR Skilled Average (Bricklayers, Carpenters, Iron workers): $3.594. ENR Common Average $2.334.

* Cost of living bonus incl. in base pay. † FB. •a 6 hr. day. •b 7 hr. day. •c 5% vac. stamp fund plus 10¢ WF for bricklayers; 4% VF for electricians plus 8¢ WF, 1% PF. •d H & WF. •e 10¢ H & W, 10¢ VF. •f 10¢ H & W, 10¢ PF, 10¢ VF. •h $2.85 homes & housing plus 7½¢ WF. •i WF. •j Inc. 4% VF; 1% PF pd by employer. •k 10¢ WF, 5¢ VP, 5¢ HP. •l 4% VF. •m 7½¢ WF, 10¢ PF. •n 7% V & Hol. 3% H & W, 1% PF. •o 10¢ WF, 10¢ PF. •p 3% WF, 3% PF + 10¢ in lieu of pd. hol. •q 10¢ WF, 6% V & H, 3% PF. •r 4% WF, 20¢ PF. •s 5% W & PF, 4% VF, 1% NC, 1% JI, plus 6 PH. •t Inc. 10¢ WF. •u 10¢ WF, 1% PF, ½% apprent. •v 1 drum; 2 drums, 2.80. •w 10¢ WF, 10¢ VF. •x 2% VF. •y 10¢ H & W, 10¢ PF. •z 10¢ WF, 5¢ HP. •A 15¢ WF, 15¢ PF, 20¢ BF. •B 7½¢ VP, 5¢ PF, 1½¢ Ed. F. •C 9¢ H & W & Ins., 7% V & H. •D 10¢ H & WF, 5¢ indus. prom. •E 6% WF, plus travel pay per day. •F Plus $4 per day annuity contrib. •G 10¢ WF, 10¢ VF, 3¢ prom. •H 10¢ WF, 10¢ VP, 3% PF, 2% PH. •I 15¢ H & WF, 5¢ advtg. •J 5% WF, 6 PH, 3% PF. •K 25¢ W & PF, 15¢ VF, plus 6¢ misc. •L 3% WF, 3% PF, 3% VF, 1% Ed. F. •M 10½¢ WF, 7½¢ PF. •N 1% PF. •O 10¢ WF, 1% NECA. •P 10¢ H Ins., 7½¢ PF, 5¢ VF. •Q 2 drums; 1 drum $2.85/3.00 + 10¢ WF. •R 10¢ H & WF, 2¢ admin. 1¢ apprent. •S 10¢ H & WF, 15¢ PF. •T H & W, VF. •U 10¢ WF, 13¢ VF, 3¢ PF. •V 5% WF, 3% PF. •W 7½¢ WF, 1½¢ Ed. F. •X 7½¢ WF, 14¢ VF. •aa 7¢ WF, 15¢ PF. •bb 8¢ WF, 2¢ advg. •dd 17½¢ WF, 20¢ PF, 10¢ PH, 5¢ Jt Bd. •ff 10¢ H & W, 5¢ PF. •gg 10¢ ins. •hh 7½¢ H & WF, 5¢ indus. prom. •ii 4% WF, 4% PF, 6 PH.

	Truck drivers 1½ T	Truck drivers −4 cy	Truck drivers +4 cy	Tractor Operators Incl. bulldozers 34-49 hp	Tractor Operators Incl. bulldozers 70-100 hp	Tractor Operators Incl. bulldozers 100 & over	Tractor scraper 15-16 cy	Power cranes & shovels ½ cy	Power cranes & shovels ¾ cy	Motor grader oper	Air comp oper	Air tool oper
Atlanta	$1.70	$1.80	$2.05	$2.70	$2.70	$2.70	$2.70	$3.225	$3.225	$2.70	$2.475	$1.77
Baltimore	1.90+7½¢[a]	1.90+7½¢[a]	2.00+7½¢[hh]	3.15/3.30 +10¢[ab]	3.15/3.30 +10¢[ab]	3.15/3.30 +10¢[ab]	3.15/3.30 +10¢[ab]	3.55/3.70 +10¢[ab]	3.55/3.70 +10¢[ab]	3.15/3.30 +10¢[ab]	2.85/3.30 +10¢[ab]	2.00+7½¢[a]
Birmingham	1.73	1.92[ff]	2.18[gg]	2.79	2.79	2.79	2.93	2.93	2.93	2.89	2.52	1.75
Boston	2.395[t]	.....[c]	.....[c]	3.275+10¢[ad]	3.275+10¢[ad]	3.275+10¢[ad]	3.275+10¢[ad]	3.65+10¢[a]	3.65+10¢[a]	3.275+10¢[a]	3.20+10¢[a]	2.60+7¢[aa]
Chicago	2.16+12¢[fe]	.....	.....	3.15+5¢[a]	3.30+5¢[a]	3.20+5¢[a]	3.00+5¢[a]	3.75+5¢[a]	3.75+5¢[a]	3.25+5¢[a]	3.10+5¢[a]	.....
Cincinnati	2.33[oo]	2.43[oo]	2.53[oo]	3.225	3.225	3.225	3.225	3.475	3.475	3.475	3.475	3.475
Cleveland	2.625+10¢[e]	2.625+10¢[e]	2.625+10¢[e]	3.49	3.49	3.49	3.49	3.74	3.74	3.49	3.365	3.365
Dallas	1.625	1.625	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.625[l]	1.625/2.00[l]	1.775/2.00[l]
Denver	2.20	2.30	2.45	2.20	2.80	2.80	2.80	2.95	2.95	2.80	2.80	2.40
Detroit	2.61	2.61	2.61	3.50+10¢[a]	3.50+10¢[a]	3.50+10¢[a]	3.50+10¢[a]	3.50+10¢[a]	3.50+10¢[a]	3.50+10¢[a]	3.225+10¢[a]	2.71+25¢[mm]
Kansas City	2.23[n]	2.23[o]	2.305[p]	2.425	2.925[q]	2.975[q]	2.975[r]	3.22	3.22	2.835	2.975[t]	2.35
Los Angeles	2.63+7½¢[a]	2.63+7½¢[a]	2.83+7½¢[a]	3.47+10¢[a]	3.47+10¢[a]	3.47+10¢[a]	3.56+10¢[a]	3.56+10¢[a]	3.56+10¢[a]	3.56+10¢[a]	2.74+10¢[a]	2.71+7½¢[a]
Minneapolis	2.40	2.40[g]	2.55[i]	2.78	3.00[q]	......	3.00	3.22[y]	3.48[z]	2.78	2.67	2.53
New Orleans	1.75	2.00	2.00	2.275+7½¢[a]	2.925+7½¢[a]	2.925+7½¢[a]	2.925+7½¢[a]	2.925+7½¢[a]	2.925+7½¢[a]	2.925+7½¢[a]	2.275+7½¢[a]	1.70
New York	2.21+22½¢[cc]	2.75+14¢[bb]	2.75+14¢[bb]	3.525+28¢[h]	3.525+28¢[h]	3.525+28¢[h]	3.65+29¢[h]	4.40+35¢[h]	4.40+35¢[h]	3.65+29¢[h]	3.65+29¢[hi]	3.25+16¢[ss]
Philadelphia	—2.215/2.35+12½¢[w]—			—3.20½/3.95½+10¢[a]—			3.20½/3.95½ +10¢[a]	—3.20½/3.95½+10¢[a]—		3.20½/3.95½ +10¢[a]	3.20+10¢[a]	2.25+10¢[a]
Pittsburgh	2.27+15¢[m]	2.40+15¢[m]	2.50+15¢[m]	3.23+10¢[a]	3.23+10¢[a]	3.23+10¢[a]	3.23+10¢[a]	3.42+10¢[a]	3.42+10¢[a]	3.42+10¢[a]	3.06[u]/3.60[v]	2.25+15¢[m]
St. Louis	2.50+7½¢[av]	2.60+7½¢[a]	2.60+7½¢[a]	3.45[kk]	3.45[kk]	3.45[kk]	3.45[kk]	3.45[kk]	3.45[kk]	3.45[kk]	2.90[kk]	2.90[kk]
San Francisco	2.55+10¢[s]	2.55+10¢[s]	2.69+10¢[s]	3.32+10¢[s]	3.32+10¢[s]	3.32+10¢[s]	3.32+10¢[s]	3.65+10¢[s]	3.65+10¢[s]	3.48+10¢[s]	2.93+10¢[s]	2.775+10¢[s]
Seattle	2.80+17½¢[ns]	2.80+17½¢[dds]	3.00+17½¢[see]	3.10+20¢[tt]	3.10+20¢[tt]	3.10+20¢[tt]	3.10+20¢[tt]	3.46+20¢[tt]	3.46+20¢[tt]	3.19+20¢[tt]	2.85+20¢[tt]	2.71+10¢[a]
Montreal	1.40+11¢[ll]	1.40+11¢[ll]	1.40+11¢[ll]	1.60+15¢[ll]	1.83+15¢[ll]	1.83+15¢[ll]	1.83+15¢[ll]	2.09+16¢[ll]	2.09+16¢[ll]	1.83+15¢[ll]	1.70+15¢[ll]	1.70+15¢[ll]
Toronto	1.60+6¢[ii]	1.60+6¢[ii]	1.60+6¢[ii]	2.00+8¢[ii]	2.10+8¢[ii]	2.10+8¢[ii]	2.10+8¢[ii]	2.60+10¢[ii]	2.60+10¢[ii]	.....	2.15+9¢[ii]	2.15+9¢[ii]

•a H & WF. •b lower rates, straight time; other broken. •c 2-axle; 10 wh. 3 axle $2.45; Euclid $2.65. •d intermediate. •e bldg contr.; highway $2.45+7¢ WF. •f less than 2-T. •g up 6 cy. •h 4% WF, 4% PF. •i 6-8 cy. •j plus $2 pd by employer for hosp. death benefits to family. •k bldg constr; steel contr $3.475. •l higher rates are union, other taken from min. wage approved by County Comm. Court. •m 10¢ H & W, 5¢ PF. •n flatbed. •o under 10 cy. •p over 10 cy. •q over 50 hp. •r blade grader. •s WF. •t single. •u incl. 10¢ H & W. •v incl. 7½¢ H & W. •w 7½¢ H & W. 5¢ PF. •x 7½¢ WF, 10¢ PF. •y to 3½ cy. •z 3½ cy & over. •aa plus W & PF. •bb 3% WF, 2% PF; plus 11 PH. •cc 11¢ WF, 11½¢ PF, 11 PH. •dd up to 5 cy. •ee 5 cy & over. •ff 1½ to 3 T. •gg up to 5 T; 5 T & over, 2.25. •hh 5¢ H & WF, 2½¢ PF. •ii 4% VF. •kk Incl. 10¢ WF. •ll FB. •mm 10¢ H & WF, 10¢ ins. 5¢ VP. •oo Plus $2.25 wk. WF. •ss 5% WF, plus 6 PH. •tt 10¢ H & WF, 10¢ PF.

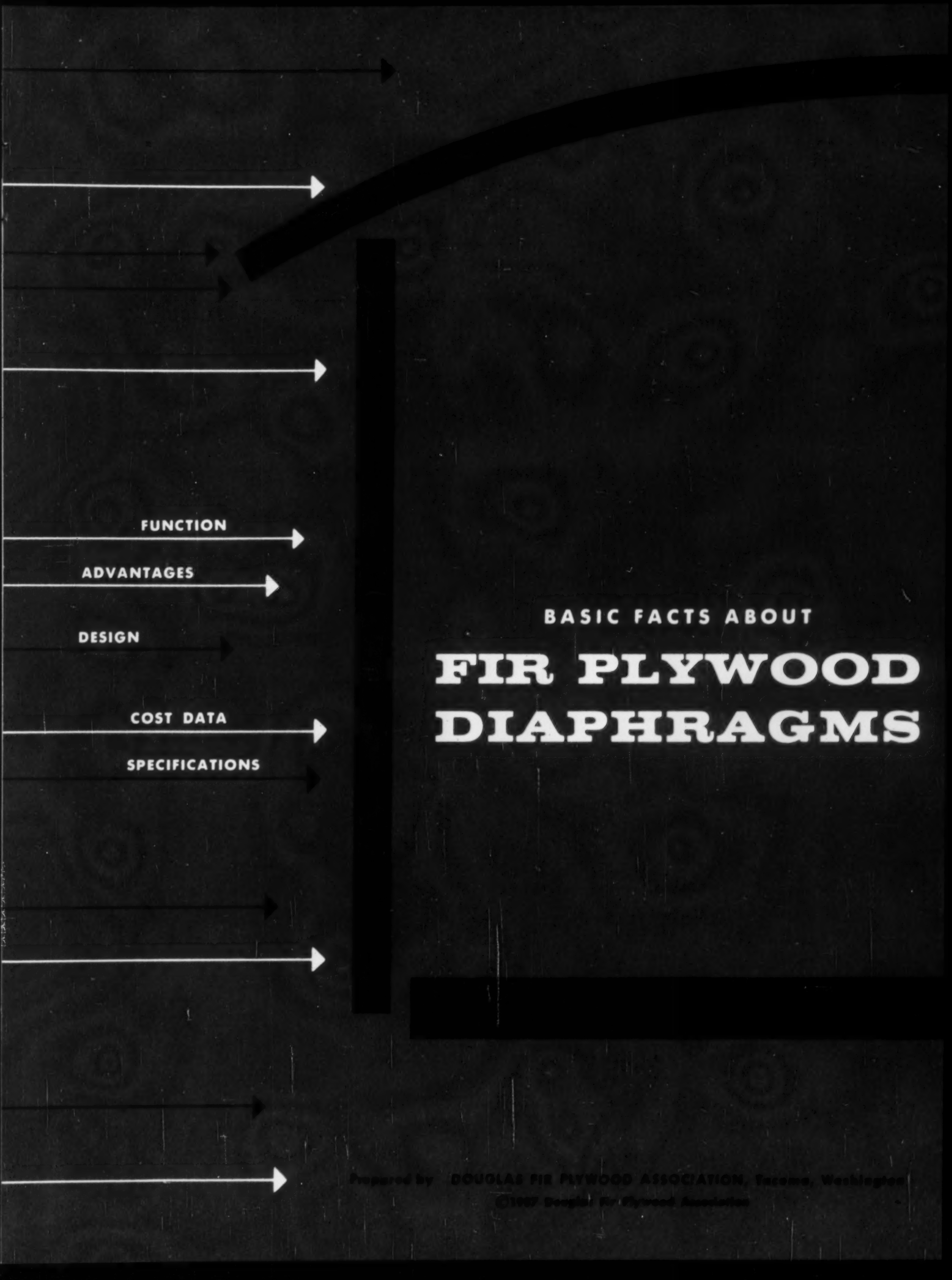
MEXICO CITY PRICES

n Pesos, F.o.b. City		Aug. '57	Sept. '57
Common Wages—Building (8 hr. day) (Peons)	av. per hr.	1.38	1.38
Common Wages—Heavy Const. (8 hr. day) (Peons)	av. per hr.	1.38	1.38
Skilled Labor Wages			
Carpenters (8 hr. day) 1 cl.	av. per hr.	2.48	2.48
Bricklayers (8 hr. day) 1 cl.	av. per hr.	2.48	2.48
Struct. Iron Workers (8 hr. day)....Remachadores.	av. per hr.	3.77	3.77

Struct. Steel, Shapet		Aug. '57	Sept. '57
3″-15″ x 12 meters	per metric ton	2100.00#	2100.00#
# fob Monterrey			
Reinf. Steel, Corr. Rods			
[illegible]″ x 11 meters	per ton	2000.00	2000.00
[illegible]″ x 11 meters	per ton	2000.00	2000.00
[illegible]″ x 11 meters	per ton	2000.00	2000.00
[illegible]″ x 11 meters	per ton	2000.00	2000.00
[illegible]″ x 11 meters	per ton	2000.00	2000.00
1″ x 11 meters	per ton	2000.00	2000.00

Gravel truck load at 3½ cu. meters		Aug. '57	Sept. '57
Blue Gravel	per tr. load	75.00	75.00
Rose Gravel	per tr. load	73.00	73.00
Cement, Std. Port. (Tolteca)	per tan	240.00	240.00
Lumber			
1″ Pine	per M ft.	1400.00	1400.00
1½″ Pine	per M ft.	1650.00	1650.00

• Next Report: See ENR Oct 31



FUNCTION

ADVANTAGES

DESIGN

COST DATA

SPECIFICATIONS

BASIC FACTS ABOUT

FIR PLYWOOD DIAPHRAGMS

Prepared by DOUGLAS FIR PLYWOOD ASSOCIATION, Tacoma, Washington

©1957 Douglas Fir Plywood Association

FIR PLYWOOD

OFFER: *strength / safety / simplicity / savings*

GENERAL Fir plywood diaphragms are a significant improvement over existing construction methods. They offer an easy, logical—and economical—way to precisely engineer structures of any size or design to withstand lateral loads caused by windstorm or earthquake.

Both design and construction of walls, floors and roofs as plywood-sheathed diaphragms are essentially simple. And since all buildings are normally sheathed, utilizing the sheathing is far more straight-forward and economical than relying on auxiliary diagonals. Also the building can be made stronger and stiffer and exact stress values are more easily determined.

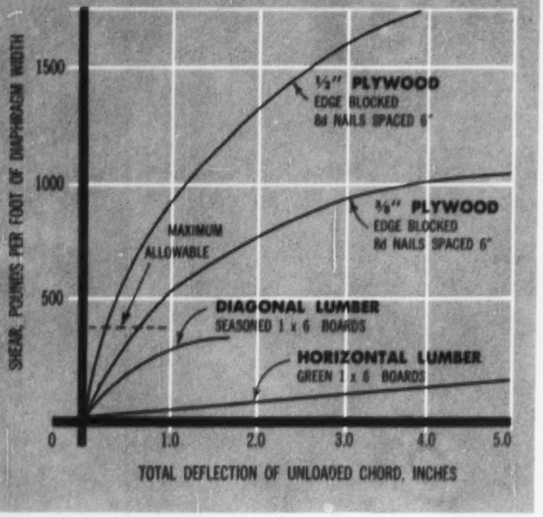
USES Plywood wall, roof, and floor diaphragms are used most commonly in wood frame buildings. Plywood roofs and floors as well as interior partitions are frequently used as diaphragms in masonry or concrete walled buildings. Plywood sheathing serves admirably as horizontal diaphragms with steel joists.

Schools, churches, auditoriums, warehouses, industrial and commercial buildings, ranging in size up to at least 500,000 sq. ft. have utilized plywood diaphragms successfully. Horizontal plywood diaphragms are particularly suitable where appearance of the exposed smooth under-surface is important. Plywood in shear walls or partitions may serve as interior finish while also performing its diaphragm function. Diaphragms may even be used to carry gravity loads, as in the case of folded plate roof construction.

Even buildings which are not ordinarily designed structurally, such as homes and farm buildings, benefit from the bracing effect of plywood sheathing, providing it is well-nailed. With ordinary good construction practice, particularly with respect to attachment of rafters to plates and sills to foundations, plywood sheathed elements will actually function as diaphragms, and thus can usually counteract the weakening effect of large areas of glass prevalent in modern buildings.

Fig. 1—RELATIVE PERFORMANCE

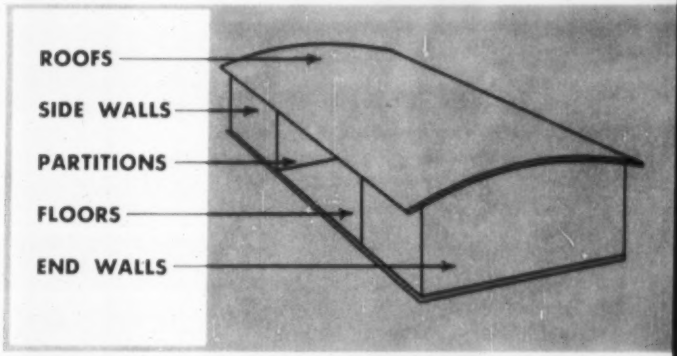
Fir plywood diaphragm construction vs. lumber. Based on test results on 20′ x 60′ roof, 2 x 10 joists, 24″ o.c., made at government and association laboratories.



DIAPHRAGMS

DESCRIPTION A diaphragm is a thin structural element, either flat or curved and usually rectangular, capable of resisting shear parallel to its edges. Hence, if suitably constructed, walls, partitions, floors, ceilings, and roofs may act as diaphragms while performing their other functions. Most diaphragms are either vertical or horizontal. Vertical diaphragms include walls and partitions, and are also called "shear walls"; horizontal diaphragms include floors and roofs–curved or gabled roofs are so classed even though not strictly horizontal.

Plywood's role in diaphragm construction stems from its unique combination of properties shown below. Basically, it is keyed by plywood's outstanding shear strength –the critical factor in diaphragm performance.



ADVANTAGES OF FIR PLYWOOD FOR DIAPHRAGM CONSTRUCTION

1. **Shear Strength** The cross-lamination plus large size provide excellent shear properties at all angles. With panels adequately spliced by nailing at all edges, the diaphragm web is fully shear–resistant, simplifying strength and stiffness calculations.

2. **Nail Bearing** Split-proof plywood has high lateral bearing strength. Develops full strength of nails on which depends shear strength of the diaphragm.

3. **Large Panel Size** Plywood's width, commonly 48", develops high moment-resisting couples on the lines of nails along opposite edges. This resistance to panel rotation adds greatly to strength of the assembly.

4. **Shock Resistance** Ability of the nailed plywood joint to sustain full load at high deformations, and of the plywood itself to withstand high impact stresses, means the diaphragm can take heavy overloads without sudden brittle failure. (See Fig. 1 opposite page)

5. **Light Weight** Light weight speeds construction, reduces dead load, which, in the case of seismic forces, also reduces diaphragm shear.

6. **Seasoned Material** Precise kiln drying, plus cross-lamination makes plywood dimensionally stable; minimizes shrinkage stresses at joints and consequent strength loss.

7. **Finish Appearance** Underside of exposed PlyScord roof sheathing is smooth, attractive, relatively joint-free. Where perfect appearance desired, other suitable plywood grades are available.

8. **Conventional Construction** Plywood construction is conventional carpentry, and familiar to most builders. Recognized by most building codes. Plywood diaphragms are specifically accepted by major regional codes.

9. **Economy** Plywood construction is the most economical method of obtaining high diaphragm strength. Total costs are competitive with ordinary lumber sheathing.

On James Sales School, Tacoma, Wash., contractor cost records show fir plywood roof diaphragm construction saved total of $3,300 over estimated cost of 2 x 6 "t&g" decking. $2,800 in actual installed cost, plus $500.00 by amortizing cost of panels previously used for formwork. Total of 27,000 sq ft. of ¾" plywood was used for roof.

Hurricane which caused millions of dollars of property losses in New Jersey area in 1950 was unable to damage development of 500 plywood beach houses, one of which is shown here. (Building at right shows punishment inflicted on ordinary construction). Diaphragm action of ⅜" Exterior plywood siding-sheathing over 2 x 3s on 24" centers enabled houses to withstand 108 mph gusts.

IMPORTANCE OF DIAPHRAGMS

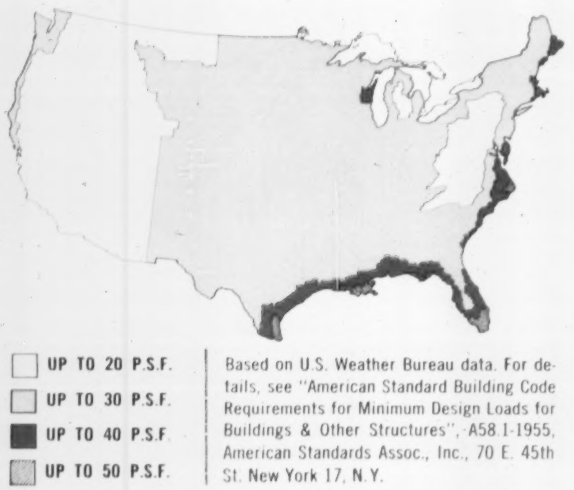


Fig. 2—SUGGESTED DESIGN WIND PRESSURES

Based on U.S. Weather Bureau data. For details, see "American Standard Building Code Requirements for Minimum Design Loads for Buildings & Other Structures", A58.1-1955, American Standards Assoc., Inc., 70 E. 45th St. New York 17, N.Y.

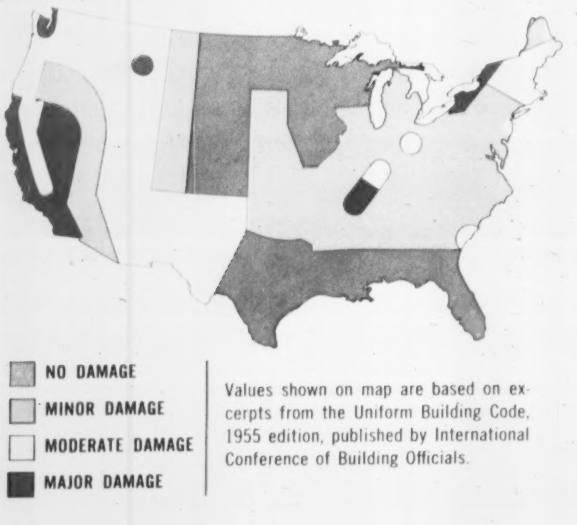


Fig. 3—ZONES OF APPROX. EQUAL SEISMIC PROBABILITY

Values shown on map are based on excerpts from the Uniform Building Code, 1955 edition, published by International Conference of Building Officials.

Diaphragms are used primarily to resist lateral loads such as wind and earthquake. The importance of these loads is often insufficiently recognized in design, even though a windstorm or earthquake of destructive force is highly probable during the normal life expectancy of the building.

For example in 1954, tornadoes were reported in all states except three. Hurricanes appear to be increasing in severity in the Southern and Eastern United States. Although design wind loads specified by codes generally range from 15 to 40 lb. per sq. ft., with stress increases permitted, severe winds can actually develop a velocity pressure of more than 50 lb. per sq. ft. (See Fig. 2)

Seismic loads demand serious consideration even though they are less common than high winds. The Pacific Coast is particularly susceptible, but only five states are rated as completely free of this hazard. (See Fig 3). Seismic forces are inertia loads, and their magnitude depends on the weight of building and contents, whereas wind forces depend on the building's size and shape.

Although not subject to design, uneven foundation settlement can also be compensated to some extent by a strong wall diaphragm.

The trend to wide, clear floor areas and large glazed openings reduces structural walls nearly to a minimum and increases the need for careful design of lateral bracing. This is provided most directly by using the building elements themselves—the floors, walls and roofs—as shear diaphragms.

Diaphragm construction differs little from ordinary framing and sheathing operations, except that boundary-member splices and anchorages and the sheathing nailing schedule assume greater importance. Inspection of these and other diaphragm construction features presents no problem. Furthermore, plywood sheathing is one bracing system that requires no tightening or similar maintenance.

Structural properties of buildings are substantially improved by sheathing with plywood. For example, full-scale tests of roof diaphragms showed ⅜" blocked plywood was 6 times as strong and 14 times as stiff within its working range as ordinary horizontal board sheathing, (Fig. 1) and several times as strong as boards applied diagonally.

Thus, with no extra effort, a building can be made stronger and stiffer than conventional structures. It will have greater resistance to racking and to distortions from uneven settlement of foundations.

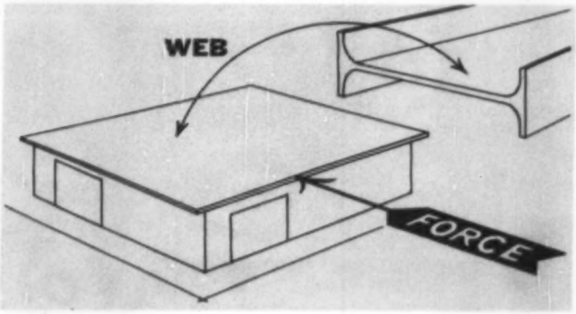
The test data illustrate also that plywood diaphragms can take severe punishment because they have high overload and impact capacity. Ultimate loads for 22 full-scale test specimens averaged over four times the allowable working loads in shear given in Table 1. Within design-load limits the diaphragms behaved elastically without developing significant set after numerous loadings. Moreover, at the ultimate load of a plywood diaphragm there is no brittle failure as with plaster and masonry, but a tenacious deformation of many inches while carrying full load. Thus, along with its great working-range stiffness, the nailed plywood diaphragm combines a capacity to absorb high impact loads without sudden failure.

HOW A DIAPHRAGM WORKS

A diaphragm resists loads much as does a plate girder. These loads may be determined from the assigned wind or seismic forces which might be distributed as illustrated in Fig. 4. The sheathing acts as the fully shear-resistant web of the girder, while the plates, bond beams or other boundary members carry all flexure acting as girder flanges in direct tension or compression. Intermediate framing members, such as joists and studs, stiffen the diaphragm against buckling and splice the plywood panel edges in shear.

As shown in Fig. 4 below, reactions for the horizontal diaphragm are the end walls and partitions of the building, so that the roof or floor acts as a simple or sometimes continuous beam turned on its side. Each wall or partition then becomes a vertical diaphragm cantilevered from the foundation and loaded along its upper edge.

To limit deflections, a maximum ratio of span length to diaphragm width of 4:1 is recommended for unblocked horizontal diaphragms; however, diaphragms having the plywood panel edges blocked need have their dimensions limited only by permissible deflections of attached walls. A maximum height-width ratio of 3½:1 has been used for blocked vertical diaphragms.



Sizes of most members—sheathing, joists and studs—are usually determined by vertical gravity (or other) loads, although framing thinner than 1⅝" is not recommended for nailed diaphragms. Boundary members may be of wood, steel, or reinforced concrete, designed and spliced to carry the direct chord stresses. As indicated, the sheathing must be attached to the boundary so as to transmit the shear. A suitable detail for wood framing is shown in Fig. 6. Shear can be effectively transmitted to steel or concrete chords by bolts or anchors.

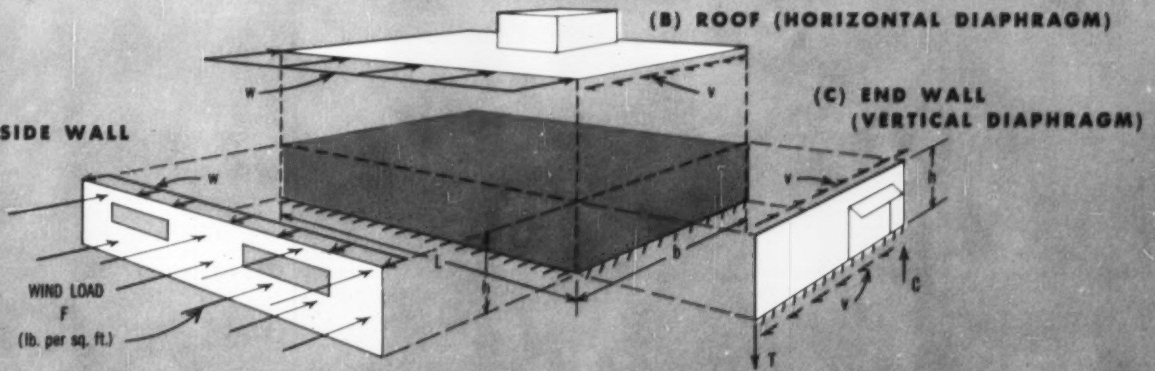
Vertical diaphragms, especially those with large height-width ratios, may require carefully designed hold-down anchors attached to the outer studs to resist overturning. Careful foundation anchorage is particularly important with light wood-frame buildings subject to high winds.

Diaphragm capacity is normally rated as the shear strength in pounds per foot across its width. This strength is usually limited by the nailing schedule along plywood edges, although certain minimum plywood thicknesses are required to develop these strengths, as shown in Table 1. PlyScord sheathing used in conventional thicknesses and spacings will normally have ample shear strength. Staggering of joints parallel to load increases diaphragm strength. Thus, the nailing along continuous unstaggered panel joints parallel to loads, including boundaries, may have to be increased under conditions noted in Table 1, Note 4.

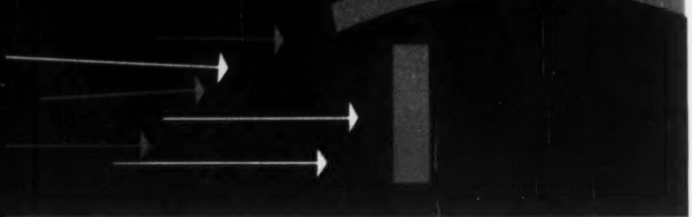
Blocking may be omitted under panel edges when shears are sufficiently low, and other conditions do not require it. In this case diaphragm strength is usually limited by buckling of the free panel edges.

Deflections of blocked horizontal diaphragms can be calculated quite accurately by a formula which considers deflections due to flexural chord strain, web shear and nail deformation (See "Design Example", Page 6)

Fig. 4—DISTRIBUTION OF LATERAL LOADS ON A BUILDING



w (lb. per lin. ft. of wall) $= F\frac{h}{2}$ v (lb. per lin. ft. of diaphragm width) $= \frac{wL}{2b}$ T (lb.) $= C = vh$



DESIGN

DESIGN SUMMARY:

The following steps are all that are needed for a diaphragm design. It is assumed that the element has already been designed to resist gravity loads, so that size and spacing of framing members and plywood sheathing thickness will have been determined. Also location of supports, such as shear walls, has been chosen so as to comply with permissible length-width ratios.

1. **Calculate lateral loads and shears.**
2. **Determine required plywood nailing schedule from Table 1*. Consider load direction with respect to staggered panel joints, as well as requirements for edge blocking, and additional boundary nailing, if needed.**
3. **Compute chord stress due to bending moment, and provide adequate splices.**
4. **Check anchorages along edges, and particularly hold-downs at bases of shear walls.**

TABLE 1 – ALLOWABLE SHEARS

For wind or seismic loadings on blocked[1] Douglas fir plywood diaphragms using Douglas fir and southern pine framing[2]

Min. plywood[3] thickness, in.	Com. nail size	Allowable shear—lb. per ft.					
		Nail spacing on all plywood panel edges[4]					
		For framing member 2⅝ in. or more in width			For framing member less than 2⅝ in. but not less than 1⅝ in. in width		
		6 in.	4 in.	3 in.	6 in.	4 in.	3 in.
5/16[5]	6d	280	420	475	250	375	420
⅜	8d	400	600	675	360	530	600
½	10d	480	720	820	425	640	730

[1] When blocking is omitted and the panels are arranged so that load is applied perpendicular to the unblocked edges and to the continuous panel joints, shears shall not exceed two-thirds of the values given for six-inch (6") nail spacing in Table No. 1. For other panel arrangements shears shall not exceed one-half of the tabulated values for six-inch (6") nail spacing.

[2] For other species, adjust values accordingly.

[3] For Douglas fir plywood grades having inner plies of species other than Douglas fir, use next greater thickness or reduce shears ¼.

[4] Nail spacing at intermediate bearings shall not exceed 12". If the force acting along either boundary or any line of continuous panel joints exceeds ¾ of the tabulated value, nail spacing along such boundary or line shall be reduced by ⅓.

[5] These values may be used with ¼-in. plywood if perpendicular loads permit.

……

*If shears are heavier than those given in table, special designs can be made by checking required plywood thickness based on its allowable shear stress, and nailing schedule based on permissible loads per nail, taking the shear as uniformly distributed across the diaphragm width. Shears listed in Table 1 actually allow for the effects of nail edge distance, spacing, and stagger of panel joints. See Section 11, "Technical Data on Plywood," published by Douglas Fir Plywood Association, Tacoma, Wash.

DESIGN EXAMPLE:

Calculate the diaphragm requirements for a 50′ x 140′ wood-framed warehouse as sketched, for a 15 psf wind load. Roof consists of bowstring trusses spaced 20′ set on columns in stud walls. Roof joists on trusses are 2 x 12 spaced 24" o.c. and solidly blocked at ends. End bay joists are sloped down from the truss to the end wall. Wall studs are 2 x 8 spaced 16" o.c. All rod, knee, and diagonal bracing, except vertical sway bracing between trusses, is eliminated in view of the diaphragm action of the plywood roof and wall sheathing.

1. Loads and Shears

Wind force at eave line on horizontal projection of long side $= 15(6' + \frac{18'}{2}) = 225$ lbs. per ft. of building length.

Max. shear at each end wall $= 225(\frac{140'}{2}) = 15{,}750$ lbs.

Unit shear roof sheathing $= \frac{15{,}750}{50'} = 315$ lbs. per ft.

Shear along top of two 18′ x 18′ end shear walls

$= \frac{15{,}750}{2\,(18')} = 438$ lbs. per ft.

2. Roof Diaphragm

Plywood panels arranged with side joints staggered, as shown in sketch, will resist shear perpendicular to the 2 x 12 roof joists more effectively than if end joints are staggered. Panel edge will be blocked with 2 x 4s spaced 48" o.c. Table 1 shows that for these conditions, ⅜" plywood will resist a 360 plf shear if attached with 8d common nails spaced 6" at panel edges and 12" at intermediate bearings. In accordance with Note 4, nails must be spaced 4" along the boundary over the end walls only, as the 315 plf shear exceeds three-fourths of the allowable tabulated value of 360 plf.

The allowable shear when blocking is omitted would be half of the 360 plf tabulated value, or 180 plf. Shear in the three 20′ center bays is less than 180 plf, so that 2 x 4 blocking could be omitted there, if desired.

The chord stress caused by bending moment in the roof diaphragm is $\frac{wL^2}{8b} = \frac{225\,(140)^2}{8\,(50)} = 11{,}020$ lbs.

DATA

With an allowable compression stress of 1000 psi, increased ⅓ for short-time loads, a single 2 x 8 will sustain 16,200 lbs. when thoroughly supported laterally. Thus the double 2 x 8 wall plate, (shown in sketch at right) with butt joints staggered and bolted with two 1″ bolts each side, makes an adequate chord member for both tension and compression.

Maximum lateral deflection of the roof diaphragm under the 15 psf wind load, assuming all panel edges blocked, can be calculated from the formula $d = \frac{5\,v\,L^3}{8\,EAb} + \frac{v\,L}{4\,Gt} + .094\,L\,e_n$

where:

d = deflection, in.
v = shear, plf
L = diaphragm length, ft.
b = diaphragm width, ft.
A = area of chord cross-section, in^2
E = elastic modulus of chords
G = modulus of rigidity of plywood (110,000 psi)
t = plywood thickness
e_n = nail deformation from Fig. 5 at calculated load per nail, based on shear per ft. divided by number of nails per ft.

$$d = \frac{5\,(315)\,140^3}{8\,(1{,}600{,}000)(24.4)\,50} + \frac{315\,(140)}{4(110{,}000)\;3/8} + .094\,(140)\,(.04) = 1.07'',$$

which is the deflection of the roof diaphragm at mid length of the building.

3. Wall Construction

Plywood will be used as combination wall sheathing and exterior finish. Three-eighth inch Exterior-type plywood, Plyshield grade, nailed directly to studs, with hot-dipped galvanized common nails, and with edges supported by blocking will function effectively as a shear diaphragm.

a. End Shear Walls

The 18′ x 18′ end walls, which carry a shear of 438 plf, consist of ⅜″ plywood nailed to 2 x 8 studs spaced 16″ and with panel edges blocked with 2 x 4s. Interpolation in Table 1 shows that 8d com. nails spaced 5″ at panel edges, 12″ at intermediate bearings, will carry 445 plf. Nailing along all four 18′ boundaries, and all continuous (i.e., unstaggered) panel joints will be 3″, for which the allowable shear is ¾ of 600 lbs., or 450 lbs., as indicated in Note 4, Table 1.

The tensile force at each bottom corner of each wall caused by overturning moment is $(438 \times 18') \times \frac{18'}{18'} = 7{,}884$ lbs.

This force will be resisted by a fabricated bent steel plate (Sketch) attached to the double 2 x 8 post with two 1″ bolts and to the concrete foundations with a 1″ tie bolt; additional strength is furnished by the corner plywood panel acting as a nailed gusset plate. The shear force along the bottom 3 x 8 sill will be resisted by three ⅞″ foundation bolts in each 18′ panel.

b. Side Walls

Calculation of wind on the end walls shows that shear along the side walls is so low (less than 50 plf) that even the minimum nailing for ⅜″ plywood of 6d common spaced 6″ at panel edges and 12″ at other bearings will be more than ample. Regular foundation bolts conventionally spaced will carry the shear, and no special hold-downs are required.

Fig. 5—LATERAL BEARING STRENGTH OF PLYWOOD JOINTS

(Douglas fir lumber; green when nailed; tested after seasoning to 13% moisture cont.; av. sp. gr. = 0.48)

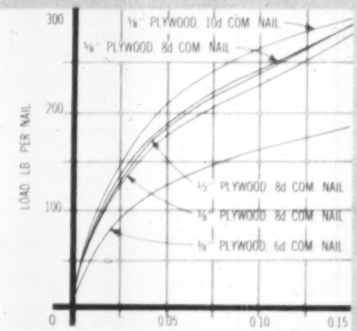
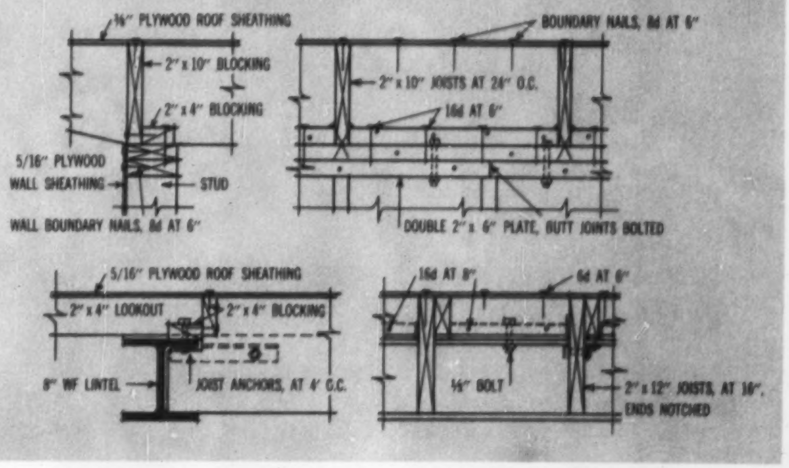
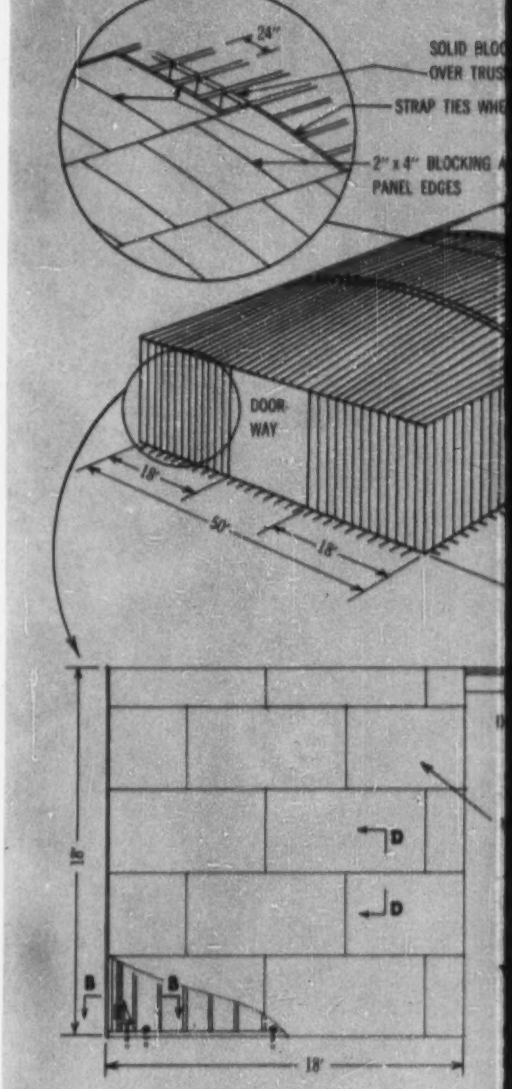
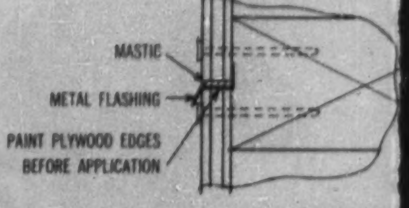


Fig. 6—Typical Fastening Details for Wood or Steel Frame Construction


⅜″ PLYWOOD ROOF SHEATHING
2″ x 10″ BLOCKING
2″ x 4″ BLOCKING
5/16″ PLYWOOD WALL SHEATHING
STUD
WALL BOUNDARY NAILS, 8d AT 6″
BOUNDARY NAILS, 8d AT 6″
2″ x 10″ JOISTS AT 24″ O.C.
16d AT 6″
DOUBLE 2″ x 6″ PLATE, BUTT JOINTS BOLTED
5/16″ PLYWOOD ROOF SHEATHING
2″ x 4″ LOOKOUT
2″ x 4″ BLOCKING
8″ WF LINTEL
JOIST ANCHORS, AT 4′ O.C.
16d AT 8″
6d AT 6″
½″ BOLT
2″ x 12″ JOISTS, AT 16″, ENDS NOTCHED

DESIGN EXAMPLE


24″
SOLID BLO
OVER TRUS
STRAP TIES WH
2″ x 4″ BLOCKING A
PANEL EDGES
DOOR-WAY
18′
50′
18′
18′
D
D
B
B
18′


MASTIC
METAL FLASHING
PAINT PLYWOOD EDGES BEFORE APPLICATION

SECTION D-D

DATA

With an allowable compression stress of 1000 psi, increased ⅓ for short-time loads, a single 2 x 8 will sustain 16,200 lbs. when thoroughly supported laterally. Thus the double 2 x 8 wall plate, (shown in sketch at right) with butt joints staggered and bolted with two 1" bolts each side, makes an adequate chord member for both tension and compression.

Maximum lateral deflection of the roof diaphragm under the 15 psf wind load, assuming all panel edges blocked, can be calculated from the formula $d = \frac{5\,v\,L^3}{8\,EAb} + \frac{v\,L}{4\,Gt} + .094\,L\,e_n$

where:

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L = diaphragm length, ft.
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A = area of chord cross-section, in^2
E = elastic modulus of chords
G = modulus of rigidity of plywood (110,000 psi)
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Fig. 5—LATERAL BEARING STRENGTH OF PLYWOOD JOINTS

(Douglas fir lumber; green when nailed; tested after seasoning to 13% moisture cont.; av. sp. gr. = 0.48)

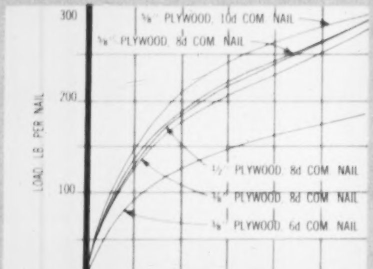
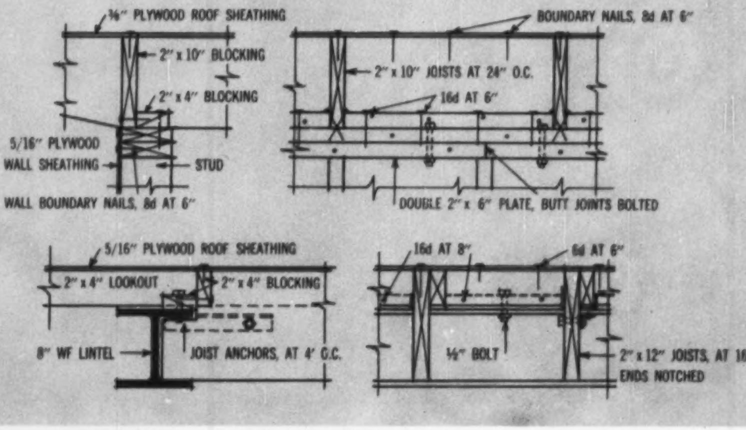


Fig. 6—Typical Fastening Details for Wood or Steel Frame Construction


⅜" PLYWOOD ROOF SHEATHING
2" x 10" BLOCKING
2" x 4" BLOCKING
5/16" PLYWOOD WALL SHEATHING
STUD
WALL BOUNDARY NAILS, 8d AT 6"
BOUNDARY NAILS, 8d AT 6"
2" x 10" JOISTS AT 24" O.C.
16d AT 6"
DOUBLE 2" x 6" PLATE, BUTT JOINTS BOLTED
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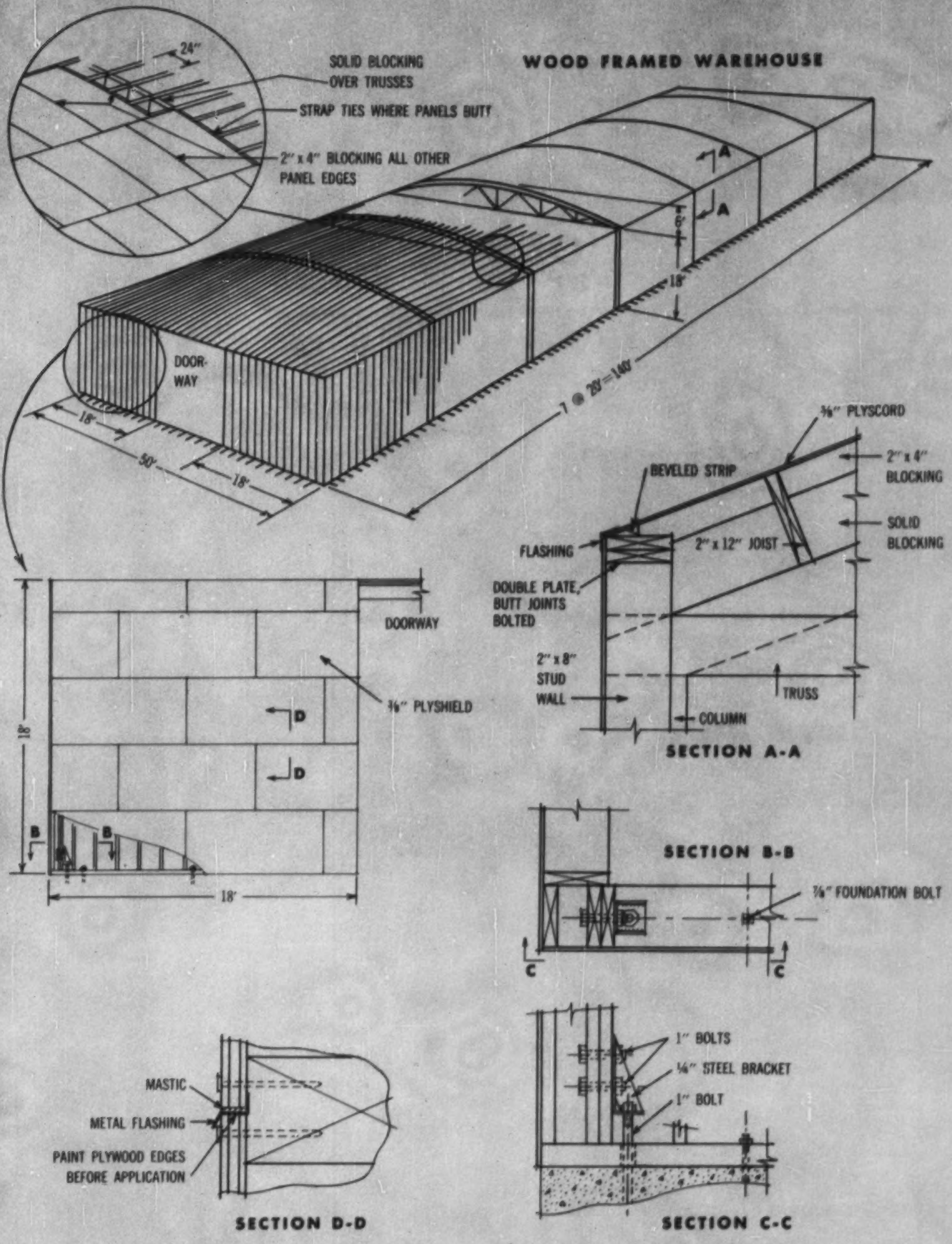
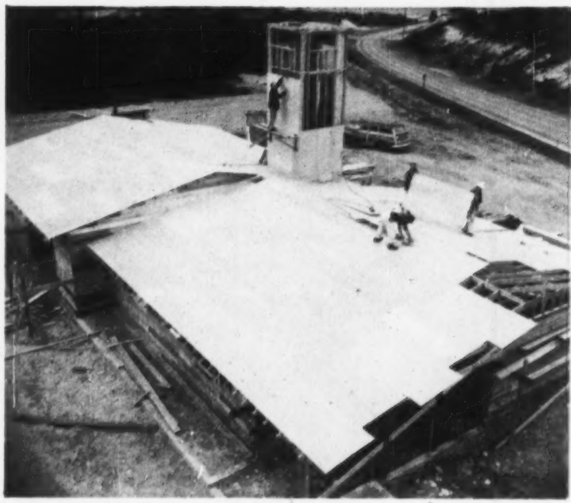
2" x 4" LOOKOUT
2" x 4" BLOCKING
8" WF LINTEL
JOIST ANCHORS, AT 4' O.C.
16d AT 8"
6d AT 6"
½" BOLT
2" x 12" JOISTS, AT 16", ENDS NOTCHED

DESIGN EXAMPLE CONSTRUCTION DETAILS


WOOD FRAMED WAREHOUSE
24"
SOLID BLOCKING OVER TRUSSES
STRAP TIES WHERE PANELS BUTT
2" x 4" BLOCKING ALL OTHER PANEL EDGES
A
A
6'
18'
DOOR-WAY
7 @ 20'=140'
18'
50'
18'
⅜" PLYSCORD
BEVELED STRIP
2" x 4" BLOCKING
SOLID BLOCKING
FLASHING
2" x 12" JOIST
DOUBLE PLATE, BUTT JOINTS BOLTED
2" x 8" STUD WALL
TRUSS
COLUMN
SECTION A-A
DOORWAY
⅜" PLYSHIELD
D
D
18'
B
B
18'
SECTION B-B
⅞" FOUNDATION BOLT
C
C
MASTIC
METAL FLASHING
PAINT PLYWOOD EDGES BEFORE APPLICATION
SECTION D-D
1" BOLTS
¼" STEEL BRACKET
1" BOLT
SECTION C-C

COST:

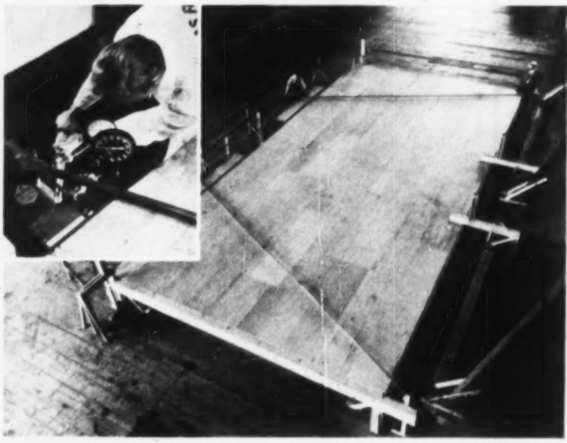
Plywood diaphragm construction generally costs no more, and usually less, than ordinary board sheathing. The diaphragms permit elimination of other forms of wall and roof bracing, which may well cost several cents per sq. ft. In addition to this, the cost in place of the sheathing itself is usually less than that of boards, basically because the large panels can be applied in fewer man-hours than boards require. For example it is typically estimated that plywood roof sheathing can be placed in 9 man-hours per thousand sq. ft., while boards require 16 man-hours for the same area. Plywood also has less waste, is applied with fewer and smaller nails, and frequently requires no building paper on walls. Conventional siding and roofing materials can be nailed directly to it. All in all, it is a highly competitive form of sheathing in its own right, even without considering its added value as lateral bracing.



ACCEPTANCES:

Plywood diaphragms are accepted by major regional building codes, including the Uniform Building Code and the Southern Building Code. The acceptances are based on engineering analyses, as verified by tests. For example, vertical plywood diaphragms have been tested by the United States Forest Products Laboratory, by the Oregon Forest Products Laboratory, and by the Douglas Fir Plywood Association laboratory in Tacoma.

In addition, some 20 horizontal roof diaphragms ranging up to 20′ x 60′ size have been tested by the Douglas Fir Plywood Association (see photo at right), while the Oregon Forest Products Laboratory has tested several of this size.



SPECIFICATIONS:

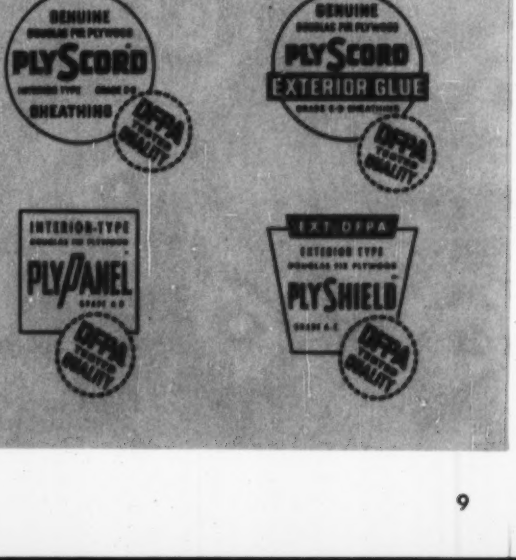
PlyScord is the grade of plywood normally recommended for diaphragm construction. The allowable shear values in Table 1 are based on all Douglas-fir veneers, which are required in PlyScord.

For normal interior applications not subject to prolonged high humidities, regular PlyScord, which also contains a mold inhibitor, is entirely suitable. Where an unusual moisture hazard exists, PlyScord with Exterior glue is recommended. When a finish appearance is desired, Exterior type plywood, such as PlyShield, or Interior type, such as PlyPanel may be used, depending on the exposure condition anticipated. Note that certain Interior grades, such as PlyPanel, permit species other than Douglas fir for inner plies, and therefore carry a somewhat lower allowable load (See Table 1 Note 3).

In any case, plywood bearing Douglas Fir Plywood Association grade-trademarks should be specified, in order to be sure that it conforms with U. S. Commercial Standard CS45-55 requirements, and the even more stringent DFPA standards, and that it has been manufactured, inspected and laboratory tested under the rigid Douglas Fir Plywood Association quality control program.

SPECIFY BY THESE DFPA GRADE-TRADEMARKS

The registered DFPA grade-trademarks below are specification guides to the right grade for a specific job. They appear only on panels quality-tested to assure conformance to rigid industry standards.



USE EXAMPLES

Over six acres of PlyScord form the roof diaphragm of this warehouse for the County of Los Angeles Purchasing Dept. The 1⅝" rafters are on 24" centers between wood bowstring trusses spaced 20'. Blocking is 3 x 4 lumber. Walls are tilt-up concrete so that seismic design shear is fairly high. Roof area is broken up into three zones for design purposes. The maximum shear is 510 plf, for which ½" plywood with 8d common nails spaced 2" is specified; for the other two zones, ⅜" plywood with lesser nailing schedules is used. Plywood is 10' x 4' cross-face, so that only a single line of blocking is required between trusses.

Vertical PlyScord diaphragms combine with steel and glass in this modern San Francisco restaurant. These vertical diaphragms make large glass areas practicable, for commanding the superb view from Fisherman's Wharf. The pile foundations do not reach bedrock, so the ⅜" wall sheathing provides not only lateral bracing against wind and earthquake, but also bracing against pile settlement or shifting by tides. Nails are 8d on 3" at panel edges and 12" intermediate. PlyScord covers all walls, roof, and floors, including one side of interior shear walls. The builder estimates plywood sheathing gave better than 50% labor-cost saving over lumber sheathing.

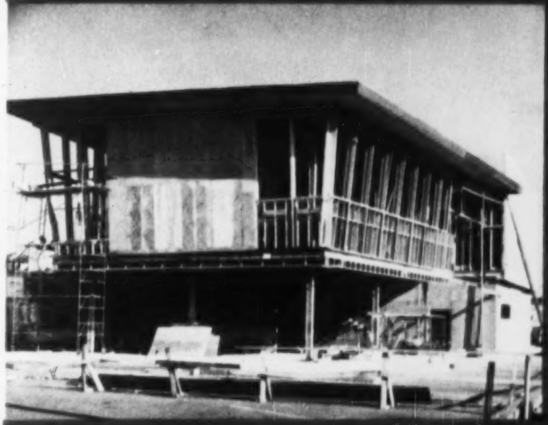
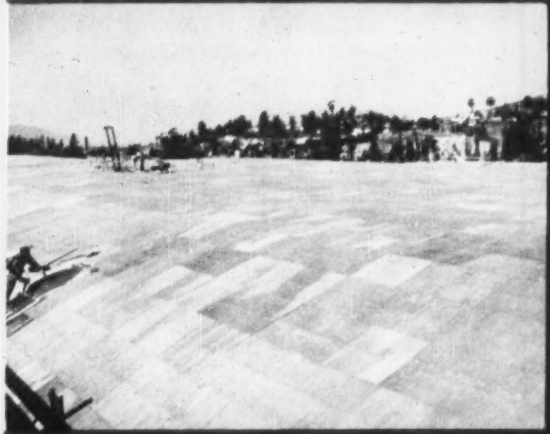


Illustration at right shows 4' x 10' panels of ½"-thick fir plywood being applied over 1⅝" lumber framing to form a roof diaphragm on this steel-framed, concrete-walled California warehouse. Full depth blocking at mid-span serves as joist bridging and also as blocking for fir plywood panel splices. On this job, pneumatic nailers were used to speed application of the fir plywood roof sheathing.

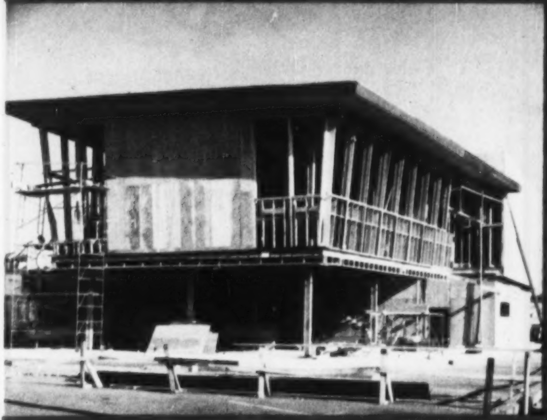
FOR MORE INFORMATION about design and construction of fir plywood diaphragms, write Douglas Fir Plywood Association, Tacoma 2, Washington for "Technical Data on Plywood," Section 11. (Offer good USA only).

USE EXAMPLES

Over six acres of PlyScord form the roof diaphragm of this warehouse for the County of Los Angeles Purchasing Dept. The 1⅝″ rafters are on 24″ centers between wood bowstring trusses spaced 20′. Blocking is 3 x 4 lumber. Walls are tilt-up concrete so that seismic design shear is fairly high. Roof area is broken up into three zones for design purposes. The maximum shear is 510 plf, for which ½″ plywood with 8d common nails spaced 2″ is specified; for the other two zones, ⅜″ plywood with lesser nailing schedules is used. Plywood is 10′ x 4′ cross-face, so that only a single line of blocking is required between trusses.



Vertical PlyScord diaphragms combine with steel and glass in this modern San Francisco restaurant. These vertical diaphragms make large glass areas practicable, for commanding the superb view from Fisherman's Wharf. The pile foundations do not reach bedrock, so the ⅜″ wall sheathing provides not only lateral bracing against wind and earthquake, but also bracing against pile settlement or shifting by tides. Nails are 8d on 3″ at panel edges and 12″ intermediate. PlyScord covers all walls, roof, and floors, including one side of interior shear walls. The builder estimates plywood sheathing gave better than 50% labor-cost saving over lumber sheathing.



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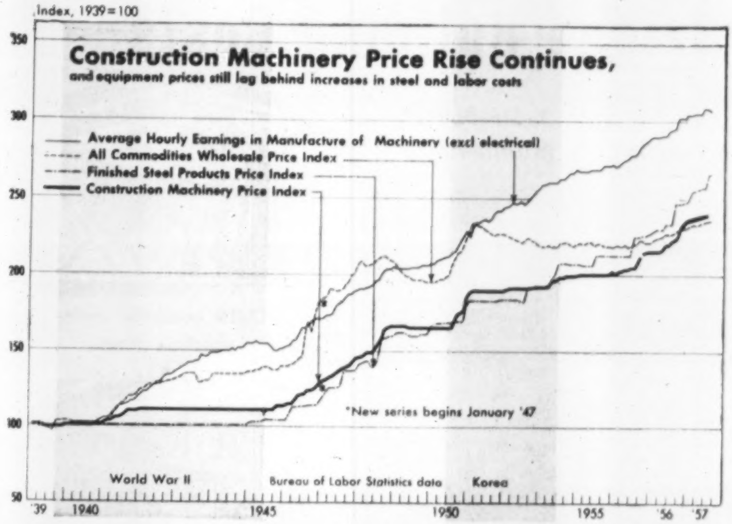
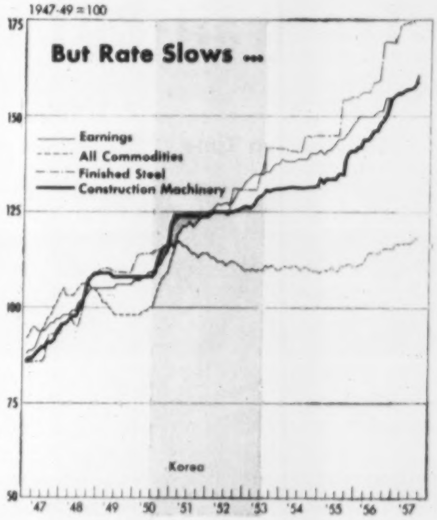




Machinery Prices Climb to New High in '57

The uptrend in construction machinery prices resumed in the second half of 1957 after six months of price stability. Many manufacturers upped their prices by from 2% to 6%, with several increases amounting to as much as 10%. Machinery makers cited rising labor costs and increased steel prices as major reasons for higher prices.

Thus for the third consecutive year the second half has brought many price increases for construction machinery. Between July 15 and August 15 (latest available as we go to press) the Bureau of Labor Statistics Primary Market Price Index for Construction Machinery rose 2% to a new all-time high of 161.1, based on average prices in 1947-49 as 100. This index is now 7.8% above August '56. Moreover, price increases on additional lines are expected before the end of '57 and they will push the BLS Index still higher.

The Contractor's Equipment Cost Index of Marshall & Stevens, Inc., Chicago, shows a 7.8% rise between September '56 and September '57. This is equal to the BLS Index rise during the 12 months ending August '57.

Construction Equipment Cost Index, 1926=100

By Marshall & Stevens, Chicago

1914	59.2	**1926**	100.0	**1938**	82.9	**1950**	166.2
1915	61.2	**1927**	95.9	**1939**	82.4	**1951**	177.3
1916	67.5	**1928**	96.8	**1940**	83.4	**1952**	177.8
1917	88.2	**1929**	91.0	**1941**	92.0	**1953**	179.6
1918	122.6	**1930**	86.1	**1942**	100.8	**1954**	183.0
1919	129.0	**1931**	77.6	**1943**	101.3	**1955**	188.2
1920	154.4	**1932**	71.9	**1944**	101.6	**1956**	205.6
1921	119.7	**1933**	71.8	**1945**	102.5	**9/56**	207.9
1922	83.5	**1934**	76.0	**1946**	124.2	**12/56**	.....
1923	97.3	**1935**	79.7	**1947**	150.3	**3/57**	.....
1924	107.2	**1936**	83.0	**1948**	161.1	**6/57**	222.8
1925	105.4	**1937**	87.2	**1349**	161.1	**9/57**	224.1

Construction Machinery Price Trend

BLS Primary Market Price Indexes, U.S. Department of Labor, 1947-49 = 100

	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Aug. 1957
All Types of Equipment	90.0	101.8	108.3	111.5	123.6	125.4	129.3	131.6	137.1	148.6	161.1
Cranes, Draglines, Shovels	91.0	101.5	107.5	110.8	123.5	123.9	127.8	130.9	138.1	149.1	160.2
Shovel, ½ cu yd	92.5	102.3	105.2	108.6	123.1	123.7	126.4	128.6	134.1	143.5	150.9
Shovel, ¾ cu yd	90.7	102.1	107.2	112.8	127.5	128.8	133.4	133.3	140.3	153.4	162.9
Shovel, 1-1½ cu yd	87.8	102.3	109.9	114.2	127.6	127.2	135.3	136.6	144.7	159.2	172.4
Shovel, 2 cu yd	92.3	102.6	105.1	110.5	126.0	124.3	124.7	126.4	126.7	134.4	147.1
Shovel, 3-3½ cu yd	89.7	101.6	108.7	113.6	126.7	129.1	130.2	130.8	133.3	146.0	158.3
Shovel, 6 cu yd.	84.5	103.3	112.2	117.0	129.8	131.7	136.7	138.8	145.4	160.9	176.5
Crane, truck mounted	90.1	101.6	108.3	112.4	126.4	126.4	131.6	133.7	141.5	154.5	162.1
Bucket, clam shell	91.8	99.0	109.2	110.3	116.7	119.1	122.6	124.5	130.6	137.0	152.7
Bucket, dragline	93.1	99.5	107.4	104.0	112.6	112.6	119.2	134.9	155.4	166.6	180.8
Crane, tractor mounted	94.2	101.4	104.4	106.4	110.0	110.0	110.3	111.9	115.6	120.3	131.7
Scrapers and Graders	89.0	102.2	108.8	112.0	128.0	128.9	129.0	129.4	133.1	142.8	153.5
Scraper, 4 Wheel, 8-8.4 cu yd	91.3	101.0	107.8	110.9	125.4	126.0	126.0	126.7	128.9	139.2	155.0
Scraper, 4 Wheel, 14.4-15.2 cu yd	94.4	101.0	104.7	107.7	127.1	126.9	124.4	124.4	126.1	134.3	151.3
Scraper, 2 Wheel (a)									100.0	109.2	118.4
Grader, heavy duty	88.2	102.6	109.2	112.3	127.1	128.6	133.0	134.8	137.8	147.6	159.3
Grader, light & medium	85.5	103.1	111.4	114.7	130.2	131.1	129.7	129.4	135.4	146.1	152.2
Tractors	87.7	102.2	110.2	113.7	125.1	128.7	136.3	140.4	145.7	160.5	175.2
Wheel-type, off-highway (a)	....	.....	.....	.....	.....	.....	.....	.....	100.0	113.0	122.1
Crawler type											
30-35 dhp	89.5	102.2	108.3	111.5	121.9	128.0	135.5	142.3	148.3	160.3	170.8
37.0-45.1 dhp	89.1	101.7	109.3	112.7	125.1	128.8	135.6	139.0	145.0	161.0	177.6
60.5-75.0 dhp	86.1	103.0	110.9	113.5	123.6	126.9	137.2	141.7	146.8	164.6	183.4
102.0-116.0 dhp	87.3	101.7	111.0	114.1	124.6	127.9	137.3	140.6	148.2	164.7	182.4
126.0-155.0 dhp	86.8	102.3	110.9	116.4	130.1	136.5	143.9	150.4	154.1	169.9	183.5
Machinery, Tractor Mounted	87.6	102.8	109.6	112.5	122.9	129.9	132.4	133.8	136.7	145.8	160.2
Dozer, cable control	82.7	104.3	113.0	115.2	122.6	134.2	140.2	141.4	143.0	148.5	151.6
Dozer, hydraulic control	87.2	103.0	109.8	112.6	122.9	134.0	136.8	138.9	143.3	155.2	175.1
Cable, power control unit	89.0	103.9	107.2	109.2	123.1	121.8	122.2	123.1	126.6	133.0	147.9
Loader, shovel type	91.1	100.6	108.3	111.9	123.4	124.5	125.1	125.7	127.4	136.9	151.3
Specialized Machinery	91.5	102.7	105.8	109.7	119.5	119.3	122.8	123.4	126.0	136.2	144.8
Ditcher	87.4	104.4	108.3	111.4	118.6	118.7	121.7	124.2	129.2	142.5	151.8
Roller, tandem	96.7	101.6	101.7	113.6	130.9	129.2	144.3	146.0	147.5	164.3	181.7
Roller, 3 wheels	95.6	101.4	102.9	110.1	124.8	126.9	130.8	131.4	132.0	143.3	154.8
Ripper and rooter	90.5	101.1	108.5	109.3	116.7	115.6	114.4	116.7	118.4	126.0	143.3
Dewatering pump, 10 M gph	92.1	101.2	106.7	107.0	109.7	107.7	107.8	103.8	101.4	106.1	108.1
Dewatering pump, 90 M gph	88.6	101.3	110.2	111.5	117.0	117.0	117.9	115.8	119.9	125.7	133.3
Portable Air Compressors	93.6	101.0	105.4	109.6	124.8	124.8	124.8	125.1	133.1	135.8	156.6
Capacity, 105-125 cfm	91.3	101.0	107.7	112.1	127.9	127.9	127.9	128.4	137.1	141.2	163.7
Capacity, 210 cfm	95.8	101.1	103.1	107.1	121.7	121.7	121.7	121.7	129.2	130.3	149.9
Contractors Air Tools	93.0	101.0	106.0	108.1	120.5	120.5	123.3	125.0	128.3	144.9	164.3
Paving breaker	93.0	101.0	106.0	107.8	119.7	119.7	123.6	126.0	.....	144.4	164.6
Mixers, Pavers, Spreaders	92.7	99.9	107.5	108.4	118.0	118.1	121.3	122.0	127.7	135.3	143.1
Mixer, portable, 6 cu ft	92.8	101.7	105.5	108.6	120.2	120.5	123.4	124.4	130.6	137.9	144.1
Mixer, portable, 11 cu ft	93.9	101.1	105.1	110.6	125.7	124.3	127.0	127.5	137.8	146.8	151.7
Mixer, portable, 16 cu ft	93.7	100.7	105.6	108.8	120.9	121.8	125.5	127.5	138.2	146.3	153.6
Mixer, truck 4½ cu yd	95.7	99.8	104.5	107.5	117.3	117.3	111.2	108.4	109.1	114.8	122.1
Mixer, paving, 34 cu ft	93.6	99.9	106.5	117.5	126.8	127.9	130.5	132.5	143.1	155.9	171.2
Concrete finisher	93.1	99.9	107.0	109.9	121.6	122.3	135.8	143.0	150.5	160.4	171.1
Bituminous distributor	90.2	97.0	112.9	103.9	106.7	106.7	108.3	105.0	103.9	109.6	115.9
Bituminous spreader	91.8	100.4	107.8	111.8	119.6	119.6	119.6	119.6	135.7	145.7	160.3
Bituminous paver	90.4	102.4	107.2	110.1	118.2	119.7	129.7	136.9	140.5	145.3	149.8

*a January 1955 = 100

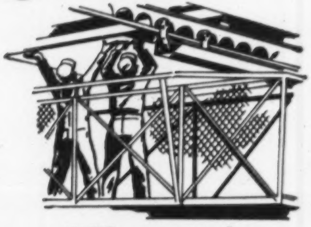
Tramrail CUTS Bridge Building Costs

1. SAVES *Construction Time*

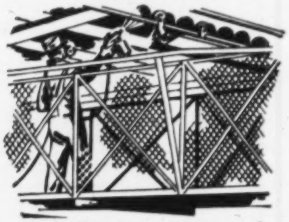
2. SPEEDS *Inspection and Painting*

3. SIMPLIFIES *Maintenance*

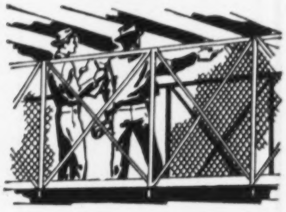
Dalles Bridge over Columbia River between Washington and Oregon. Equipped with a Cleveland Tramrail System including six traveling service platforms operating between piers. The platforms are 36'-6" long and extend beyond the bridge sides.



CUTS concrete form erection time.



SAVES many hours of painting time.



MAKES bridge inspection a simple, easy job.

A CLEVELAND Tramrail Bridge Servicing System can effect such large savings in bridge construction that no bridge builder can afford to overlook this latest development.

The Tramrail installation on the Dalles Bridge over the Columbia River is a good example of this. The equipment was included in the original design. By erecting it in the early stages of construction, the bridge builder was able to pay himself a handsome "bonus" resulting from the efficiency that it brought about.

The equipment made possible savings in several ways. It drastically reduced man-hours required for setting bridge deck forms prior to pouring the concrete. It speeded assembly of many structural members. It simplified placing of electric conduits. It aided bridge inspection and saved a large amount of painting time.

The Tramrail continues to be an important cost-reducing and safety factor now that the bridge is completed. Periodical inspections can be made easily and quickly. Any maintenance underneath can readily be taken care of. Painting and sandblast equipment can be stored on the service platform, making the work easier and, of course, less costly.

Cleveland Tramrail engineers in the principal cities in the U.S.A. and Canada stand ready to serve you.

Cleveland Tramrail
Engineering and Application Data

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THE CLEVELAND CRANE & ENGINEERING CO.
3187 East 284 Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Machinery Rental Rates Increase During 1957

Construction machinery rental rates vary widely throughout the United States, depending upon local practices and conditions. But a general uptrend is indicated by the 1957 compilation of existing rates (representing approximate over-all averages of rentals charged in the U.S. for specific types of machinery).

These averages of prevailing rental rates have been made available for informational purposes only by the Associated Equipment Distributors, Chicago, Ill. Specific types of machines have been selected from the AED's Ninth Edition Compilation, available at $5 per copy at Associated Equipment Distributors, 30 East Cedar St., Chicago, Ill.

The table below shows how rates have increased 1956-57 for many types of machinery. However, rentals are below 1956 for some types. No changes are shown for 1957 items not included in the AED's 1956 compilation.

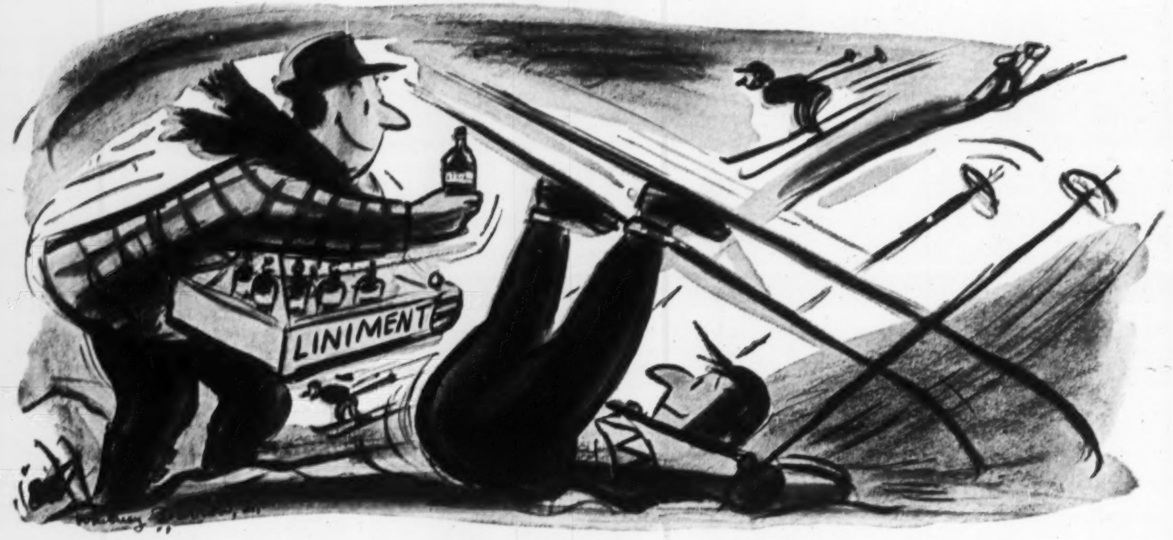
All rates are fob lessor's warehouse or shipping point. Lessee pays transportation costs to destination and return. Rates do not include operator, fuel or oil. Lessor bears cost of repairs due to normal wear and tear on non-tractor equipment, the lessee bears all other costs. For tractor and rubber-tired hauling equipment, the lessee bears all costs for maintenance and repair. Rates are based on one shift of 8 hours per day, 40 hours per week, 175 hours per month of a 30 consecutive day period. Overtime is prorated on a per-hour basis. Equipment is delivered to lessee in good operating condition and returned in as good condition less normal wear. Excessive cleaning or repairs may be charged to lessee. Rental rates start when equipment leaves lessor's delivery point. All rents are payable in advance. No insurance, license, sales or use taxes are included in these rates.

Construction Machinery Rental Rates — 1957

Associated Equipment Distributors, Chicago, Ill.

Type of equipment	Per Month	Per Week	Per Day	Per Cent Change 1956-57† % Minus % Plus
Air compressors, portable:				
Gas, 86-105 cfs	$189.00	$62.50	$18.75	+1
Gas, 126-160 cfs	248.00	82.25	24.25	+1
Gas, 186-210 cfs	332.00	108.00	32.75	0
Gas, 251-315 cfs	446.00	147.00	44.75	0
Diesel, 186-210 cfs	410.00	135.00	43.25	−1
Diesel, 251-315 cfs	536.00	176.00	56.75	0
Diesel, 366-500 cfs	761.00	253.00	81.25	*
Diesel, 501-600 cfs	922.00	306.00	99.00	+1
Cranes, cap at ft radius:				
Diesel crawler (no bucket)				
Above 5, to 6⅛ ton, 10′	899.00	294.00	99.25	+3
Above 6⅜, to 8⅜ ton, 12′	1083.00	362.00	122.00	*
Above 8⅜, to 11⅜ ton, 12′	1248.00	413.00	138.00	*
Above 14½, to 19½ ton, 12′	1436.00	480.00	159.00	+2
Above 24½, to 29½ ton, 12′	2117.00	698.00	228.00	*
Above 29½, to 34½ ton, 12′	2291.00	737.00	251.00	*
Above 18, to 22 ton, 20′	2891.00	951.00	312.00	*
Above 10, to 13 ton, 45′	3846.00	1283.00	420.00	*
Above 20, to 24½ ton, 45′	4977.00	1702.00	572.00	*
Graders, diesel rubber tired:				
Conventional transmission				
Up to 16,500 lbs	657.00	213.00	67.75	+8
16,501 to 20,500 lbs	831.00	262.00	81.25	+5
22,501 to 26,000 lbs	1122.00	366.00	115.25	+6
26,001 to 30,000 lbs	1272.00	424.00	136.25	+5
Torque converter				
16,000 to 21,000 lbs	1109.00	358.00	112.75	+9
21,001 to 25,000 lbs	1290.00	437.00	142.00	+8
25,001 to 29,500 lbs	1461.00	489.00	163.00	+4
29,501 to 45,000 lbs	1919.00	664.00	219.75	+6
Loaders (Shovel), tractor				
Front end, wheel, mounted, front or rear drive, gas				
Up to ⅜ cy	327.00	108.00	37.25	+4
Above ⅜, up to ½ cy	381.00	126.00	40.25	−1
Above ½, up to ⅝ cy	425.00	142.00	47.00	+3
Above ⅝, up to ¾ cy	510.00	183.00	55.25	+8
Above ¾, up to 1 cy	608.00	212.00	66.75	+3
Above 1, up to 1¼ cy	753.00	258.00	81.50	+10
Above 1⅝ up to 2 cy	1224.00	404.00	124.00	+9
Mixers, concrete, portable:				
Tilt drum, 3 to 3½ cf	65.00	23.00		−1
Tilt drum, 6 cf	94.75	34.00		*
Tilt drum, 9 cf	105.00	37.00		*
Non-tilt, non pwr charge, 3½ cf	82.75	28.75		−1
Non-tilt, power charge, 6 cf	126.25	44.00	14.25	+1
11 cf	183.00	64.25	21.50	−2
16 cf	258.00	89.25	28.25	+5
Add for batchmeter*	12.50	4.55	1.80	+11
Add for pump*	10.25	3.30	1.25	+4
*Rates include measuring tank but not this				
Pumps:**				
Centrifugal, self priming				
Gas, 1½-in, 3M-4M	50.00	17.25	5.75	*
Gas, 2-in, 7M-10M	61.50	21.25	7.15	*
Gas, 3-in, 15M-20M	76.75	26.50	8.95	*
Gas, 4-in, 30M-40M	117.00	40.25	13.50	*
Gas, 6-in, 90M	179.00	61.25	20.25	+1
Diesel, 6-in, 90M	359.00	122.00	41.75	+4
Diesel, 8-in, 125M	533.00	183.00	59.50	+2
**Hose not included				
Rollers:				
Two-axle tandem, diesel				
5-8 tons	538.00	174.00	57.50	+5
6-9 tons	606.00	198.00	67.25	*
8-10 tons	645.00	214.00	72.00	+9
8-14 tons	714.00	239.00	76.50	+14
10-14 tons	817.00	276.00	84.50	+11
10-16 tons	1230.00	317.00	92.50	*
Shovels—diesel crawler				
⅜ cy	$924.00	$306.00	$101.00	
½ cy	1189.00	395.00	131.00	0
¾ cy	1442.00	499.00	165.00	0
1 cy	1843.00	606.00	201.00	+5
1½ cy	2644.00	855.00	287.00	0
2 cy	3625.00	1226.00	395.00	+6
2½ cy	4350.00	1446.00	486.00	+6
3 cy	5656.00	1834.00	588.00	
3½ cy	6299.00	2085.00	670.00	
Scrapers, w.o. power units				
Heaped mass				
Above 5, up to 7 cy	363.00	115.00	37.25	+3
Above 7, up to 10 cy	488.00	156.00	49.00	−1
Above 10, up to 13½ cy	596.00	185.00	56.75	−3
Above 13½, up to 18 cy	722.00	240.00	72.00	−2
Above 17, up to 22 cy	948.00	316.00	99.25	−4
Above 22, up to 29 cy	1222.00	395.00	122.00	+3
Above 29, up to 37 cy	1752.00	523.00	166.00	+8
Tractors and scraper:				
2-wheel tractor with 2-wheel scraper (heaped mass)				
Above 6½, up to 11 cy	1505.00	524.00	166.00	+5
Above 12, up to 16 cy	2162.00	729.00	243.00	−1
Above 14½, up to 19 cy	2565.00	892.00	279.00	+1
Above 18, up to 20 cy	2894.00	998.00	315.00	+14
Above 19, up to 27 cy	3425.00	1205.00	372.00	+2
Tractors—diesel crawler:				
Gear drive, w.o. attachments				
25-35 drawbar hp	434.00	145.00	45.25	+2
36-44 drawbar hp	530.00	175.00	56.25	+2
45-59 drawbar hp	690.00	227.00	73.25	+3
60-71 drawbar hp	822.00	275.00	84.00	+3
72-79 drawbar hp	999.00	330.00	103.00	+1
80-95 drawbar hp	1029.00	342.00	105.00	+2
96-115 drawbar hp	1336.00	433.00	140.00	+2
116-131 drawbar hp	1352.00	450.00	149.00	+2
132-150 drawbar hp	1543.00	501.00	156.00	+3
151-170 drawbar hp	2009.00	639.00	201.00	+2
201-265 drawbar hp	2809.00	908.00	283.00	+1
Torque converter, without attachments				
120-144 net engine hp	1524.00	497.00	151.00	+4
145-164 net engine hp	1736.00	561.00	182.00	
165-185 net engine hp	1860.00	588.00	196.00	+3
186-214 net engine hp	2249.00	729.00	233.00	+6
251-330 net engine hp	3336.00	1068.00	332.00	+7
over 330 net engine hp	3985.00	1325.00	440.00	+2
Bulldozers:				
For crawler tractors of				
36-44 drawbar hp	165.00	55.25	17.75	+1
72-79 drawbar hp	248.00	84.75	28.75	+3
96-115 drawbar hp	298.00	94.25	33.25	+6
132-150 drawbar hp	371.00	121.00	38.75	0
201-265 drawbar hp	480.00	164.00	53.50	+2
For 4-wheel rubber tired tractor				
190-250 engine hp	1004.00	365.00	152.00	+7
Trenching machines:				
Ladder or vertical boom:				
Diesel, 4′, 12″	1217.00	406.00	131.00	+10
Diesel, 5′, 18″	1222.00	422.00	133.00	*
Diesel, 8½′, 36″	1435.00	550.00	188.00	+2
Wheel type:				
Diesel, 5′-6″, 24″	1175.00	383.00	138.00	+8
Diesel, 6′-0″, 31″	1916.00	637.00	215.00	*
Diesel, 6′-0″, 36″	2297.00	765.00	257.00	+12
Trucks, off-highway, body cap.				
Single axle, rear dump				
Above 7½, up to 10 tons	1582.00	550.00	184.00	*
Above 10, up to 15 tons	2071.00	712.00	246.00	*
Above 15, up to 20 tons	2283.00	806.00	283.00	*
Above 20, up to 23 tons	2960.00	969.00	330.00	*

† Percentage change in average monthly rates
* New classification for '57



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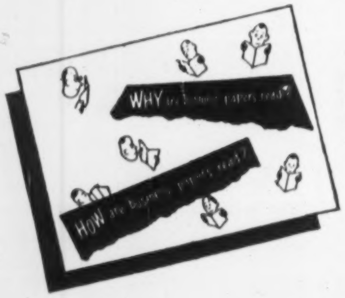
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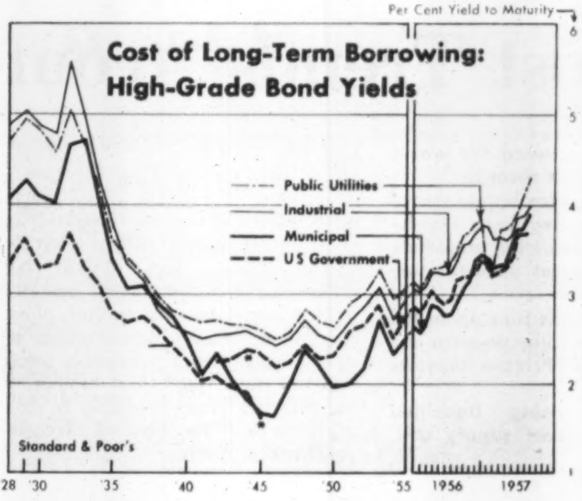
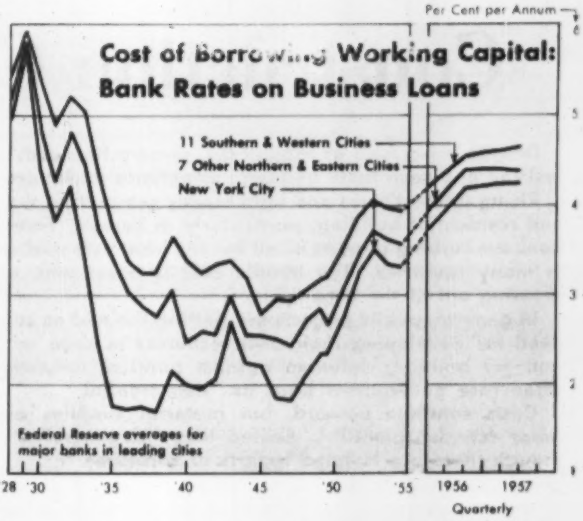




Interest Rates Soar As Borrowers Compete

The almost unprecedented demand for funds by all segments of the nation's economy in 1957 succeeded in driving interest charges up to near historic highs.

The individual consumer, the giants in industry, federal, state and municipal governments were competing against each other for both long-term capital and short-term funds.

The steady climb in borrowing costs is illustrated in the long-term borrowing field with government bonds bringing a yield to the investor in January of 3.37%. As reported by Standard and Poor's this yield rose to 3.68% in August.

State and municipal governments, according to the same source, who thought the 3.40% interest charge of January was high, watched the rate on average climb to 3.91% in August.

In fact this high yield for tax exempt debt came close to the 4% return to the investor for industrial bonds in August while in the same month public utilities were paying 4.30% to buyers of their debt issues (see table).

The rapid rise in interest charges struck at the construction industry in two ways: It discouraged some potential borrowers who decided not to go ahead with plans for new construction and it raised bank rates on business loans to a point that placed pressure on contractors who required borrowed working capital during the year.

In addition, bank loans for working capital were limited because the demand exceeded the supply.

If the contractor obtained funds to buy machinery or finance work in progress he had to keep a larger portion on deposit at the bank which in effect added still more to his debt burden.

Long-Term Borrowing Costs Bond Yields in %

Standard & Poor's

Year & Month	Govt (1)	U. S. Treas	Municipal (2)	Industrial (A1+)	Pub Util (A1+)	Railroad (A1+)
1928	....	3.33	4.05	4.88	4.68	4.34
1929	....	3.60	4.27	5.04	4.96	4.67
1930	....	3.29	4.07	4.87	4.83	4.51
1931	....	3.34	4.01	4.79	4.57	4.42
1932	....	3.68	4.65	5.58	5.01	5.37
1933	....	3.31	4.71	4.98	4.69	4.54
1934	....	3.12	4.03	4.28	4.19	4.01
1935	....	2.79	3.40	3.73	3.59	3.58
1936	....	2.69	3.07	3.34	3.38	3.31
1937	....	2.74	3.10	3.16	3.22	3.46
1938	....	2.61	2.91	2.82	2.99	3.60
1939	....	2.41	2.76	2.64	2.83	3.39
1940	....	2.26	2.50	2.57	2.75	3.26
1941		2.05	2.10	2.50	2.69	3.16
1942	2.27	2.09	2.36	2.54	2.71	3.17
1943	2.29	1.98	2.06	2.55	2.64	3.10
1944	2.38	1.92	1.86	2.58	2.64	3.01
1945	2.31	1.66	1.67	2.50	2.59	2.75
1946	2.19	Disc.	1.64	2.44	2.50	2.59
1947	2.24	....	2.01	2.52	2.59	2.62
1948	2.43	....	2.40	2.70	2.83	2.89
1949	2.28	....	2.21	2.53	2.69	2.71
1950	2.32	....	1.98	2.48	2.63	2.66
1951	2.60	....	2.00	2.72	2.89	2.91
1952	2.68	....	2.19	2.87	3.01	2.98
1953	2.90	....	2.72	3.08	3.27	3.19
1954	2.51	....	2.34	2.73	2.95	2.91
1955	2.80	....	2.53	2.97	3.10	3.04
1956	**3.06**		**2.93**	**3.34**	**3.42**	**3.39**
Jan	2.87		2.64	3.05	3.13	3.14
Feb	2.81		2.58	3.04	3.07	3.09
Mar	2.90		2.69	3.09	3.15	3.10
Apr	3.05		2.88	3.23	3.29	3.19
May	2.94		2.80	3.22	3.29	3.31
June	2.90	....	2.75	3.23	3.31	3.32
July	2.97		2.78	3.23	3.34	3.33
Aug	3.15		2.94	3.38	3.47	3.41
Sept	3.21		3.07	3.55	3.66	3.57
Oct	3.20	....	3.14	3.57	3.69	3.64
Nov	3.29		3.38	3.69	3.78	3.76
Dec	3.41		3.44	3.77	3.85	3.79
1957						
Jan	3.37		3.40	3.76	3.84	3.80
Feb	3.21		3.26	3.60	3.75	3.75
Mar	3.28	....	3.32	3.62	3.72	3.71
Apr	3.33		3.33	3.60	3.74	3.75
May	3.44		3.52	3.66	3.79	3.86
June	3.66		3.75	3.87	3.94	3.96
Jul	3.67	....	3.75	3.90	4.08	4.03
Aug	3.68	....	3.91	4.00	4.30	4.08
Sept						

(1) Taxable long-term bond series replaces Federal Reserve series on partially tax-exempt Treasury bonds (not due or callable for 15 years) which was discontinued after 1945. (2) aver. high-grade municipals

Short-Term: Bank Rates On Business Loans in %

Federal Reserve Board

	New York City	7 Other Northern & Eastern Cities	11 Southern & Western Cities
1928	4.96	5.16	5.41
1929	5.76	5.82	5.93
1930	4.39	4.84	5.40
1931	3.82	4.26	4.90
1932	4.20	4.81	5.21
1933	3.43	4.46	5.04
1934	2.45	3.71	4.32
1935	1.76	3.39	3.76
1936	1.72	3.04	3.40
1937	1.73	2.88	3.25
1938	1.69	2.75	3.26
1939*	2.15	3.05	3.62
1940	2.00	2.49	3.38
1941	1.95	2.58	3.23
1942	2.07	2.56	3.34
1943	2.70	2.98	3.38
1944	2.23	2.55	3.18
1945	2.20	2.55	2.80
1946	1.84	2.51	2.97
1947	1.83	2.44	2.95
1948	2.10	2.71	3.03
1948†	2.12	2.49	2.92
1949	2.35	2.86	3.17
1950	2.34	2.67	3.22
1951			
Mar	2.71	3.02	3.42
June	2.78	3.04	3.52
Sept	2.79	3.06	3.47
Dec	3.01	3.23	3.67
1952			
19Mar	3.23	3.47	3.79
19 June	3.27	3.46	3.90
19Sept	3.29	3.44	3.84
19Dec	3.33	3.49	3.84
1953			
Mar	3.31	3.50	3.90
June	3.52	3.71	4.05
Sept	3.52	3.71	4.10
Dec	3.51	3.79	4.10
1954			
Mar	3.50	3.74	4.03
June	3.34	3.61	3.98
Sept	3.29	3.57	3.95
Dec	3.30	3.55	3.90
1955			
Mar	3.29	3.55	3.87
June	3.30	3.55	3.95
Sept	3.54	3.76	4.11
Dec	3.76	3.95	4.17
1956			
Mar	3.75	3.93	4.19
June	3.97	4.15	4.38
Sept	4.20	4.39	4.53
Dec	4.22	4.40	4.58
1957			
Mar	4.23	4.40	4.60
June	4.23	4.39	4.65

*New quarterly series starts; rates shown are for June
†Current (third) series starts; rates shown are for June

Construction Cost Trends Around

Despite a barrage of roadblocks, construction activity around the world in 1957 has been brisk although sometimes under previous records.

Rising interest rates and tight money are putting the brakes on industrial and residential building, particularly in Europe. Foreign exchange restrictions are curbing imports of all but the most essential construction materials in many countries. The Middle East is beset with political uncertainties growing out of the Suez crisis.

In general, public projects are getting the nod as countries face up to the need for developing their own resources to cope with rising populations and for building defenses against political upheavals. Private projects often face government bans as "nonessential."

Costs continue upward, but material supplies are easing. Unskilled labor remains plentiful. Skilled labor is generally in short supply still, though there are isolated reports of surpluses.

Asia and Australia

Construction activity in the Far East has been dependent in large part upon funds from abroad, especially the United States. With future financial assistance in some doubt, efforts are being made to conserve foreign exchange and to curb expansion of industrial plants. In some cases only the most essential projects are being permitted to proceed. But the backlog of potential construction in the underdeveloped countries is huge.

• **Bangkok, Thailand**—This Far Eastern kingdom promises to be one of the most active construction centers in Asia over the coming years. With a $66 million loan from the World Bank signed in early September 1957, the Yanhee Electricity Authority of Thailand will embark on construction of a 500 ft dam on the Ping River and a powerhouse of 140,000 kw of generating capacity to supply Bangkok and other communities with electricity.

The country must import both skilled labor (equipment operators, welders, mechanics, electricians, plumbers, and supervisory personnel) as well as all construction materials except cement, stone, sand, and lumber. At present, the cement supply is inadequate to meet the demand of current construction needs.

• **Bombay, India**—The success of India's Second Five Year Plan depends on the country's ability to obtain about $1 billion in foreign aid over the next three years. The current foreign exchange difficulty arises from heavy investments in capital goods made for the First Five Year Plan. Unless outside financial aid is forthcoming, India will have to pare the plan to bare essentials—steel, transportation and port facili-

Worldwide Construction Materials Prices

Material Prices, fob City and Country, June '57 and '56 (in national currency)

	OFFICIAL EXCHANGE per $1 U.S. June '57	STRUCTURAL STEEL per cwt		REINFORCING STEEL ¾ to 1-in., per cwt		PORTLAND CEMENT per bbl		LUMBER, 2x4, S4S, Per Mfbm First class pine		Second class pine	
		6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56
ASIA AND AUSTRALIA											
City and Country											
Bangkok, Thailand	20.50 Baht	.....	4,000*a*	3,600*a*	3,300*a*	550*ab*	550*a*	3,000*cd*	3,000*cd*	950*de*	950*de*
Bombay, India	4.12 Rs	690/-*Ag*	585/-*g*	680/-*Bg*	575/-*g*	117/8*g*	102/8*g*	12/-*Ch*	12/-*Ch*	8/-*hi*	....
Colombo, Ceylon	4.76 Cey Rs	900/-*gk*	800/-*gk*	800/-*gk*	750/-*gk*	200/-*gk*	180/-*gk*	23/-*hl*	24/-*Dhl*	.....	....
Djarkarta, Indonesia	11.325 Rup.	6*Em*	.....	6*Em*	.....	35*n*	.....	2,500*co*	.....	1,800*cpq*	....
Karachi, Pakistan	4.76 PRs	2,200*Fg*	1,600*Fg*	1,800*Gg*	1,200*Gg*	120/-*g*	110/-*gy*	18/-*h*	.....	16/-*Ih*	11/-*HIh*
Kuala Lumpur, Malaya	3.03 Mal. Dol.	500*g*	.....	500*g*	.....	4.90*s*	.....	.....	.....	.....	....
Manila, P. I.	2.00 P	430*a*	400*a*	410*au*	410*a*	5.50*Lv*	5.80*Lv*	.....	.....	275*M*	275*M*
Melbourne, Australia	-/9/-A£	52/15-*gw*	51/10-*gw*	56/-*gx*	53/-*gx*	11/8-*gy*	11/0-*gy*	19/16/-*Pz*	18/10/6*Pz*	9/1/9*Qz*	9/2/6*Qz*
Saigon, Vietnam	35 Pias.	950*aak*	850*aak*	950*aak*	900*aak*	75.75*bbk*	67*bbk*	2,574*c cc*	1,940*c cc*	2,750*c*	2,100*cdd*
Sydney, Australia	-/8/11 A£	50/15*g*	50/15*g*	47/6	.....	11/13/6*gee*	11/10/6*gee*	155/6*ff*	157/6*ff*	148/-*ff*	132/6*ff*
Tokyo, Japan	360 Yen	60,000*a*	60,000*a*	50,000*a*	58,000*a*	7,400*a*	7,000*a*	4,100*hh*	4,000*hh*	3,700*hh*	3,600*hh*

•*a* per metric ton •*b* black market—1,200 baht •*c* per cu meter •*d* teak •*e* Teng Rang; Mai Yang 630, 6/57 and 6/56 •*f* crushed stone •*g* per long ton •*h* per cu ft •*i* Vella pine •*j* per 100 cu ft •*k* delivered •*l* local equivalent •*m* per kilo •*n* per 100 lb sack •*o* teak, "djati" •*p* Rasmallab •*q* jungle wood, 1,200 •*r* 125 cu ft •*s* per cwt •*t* per cu yd •*u* ⅝"; ¾" plain round bars, 400 •*v* per 94 lb bag •*w* imported 6/57, 70 to 80; 6/56, 74-80 •*x* imported 6/57, 73 to 82; 6/56, 75-81 •*y* imported 6/57, 13/10/9 to 15/15/-; 6/56, 14/15/ to 15/17/6 •*z* per 100 super ft (12"x12"x1") •*aa* per 100 kgs •*bb* bag of 50 kgs •*cc* 60x60 and beam 24x60 •*dd* plank 240x30 •*ee* 15 tons or more •*ff* radiata pine, per 100 superface •*gg* per yard •*hh* per koku (18x1'x10') •*ii* per ryutsubo (6'x6'x6')

Ranges: •*A* 640 untested to 690 tested •*B* 630 untested to 680 tested •*C* 8/- to 12/- •*D* 20/- to 24/- •*E* 4-6 •*F* 6/57, 1,800-2,200; 6/56, 1,200 to 1,600 •*G* 6/57 1,600-1,800; 6/56, 900 to 1,200 •*H* 6/56, 10/8/- to 11/- •*I* Deodar, loca equivalent, 6/57, 8/8/- to 10/8/-; 6/56, 7/8 to 9/8 •*J* 42/- to 50/- *(Continued in next column)*

	OFFICIAL EXCHANGE per $1 U.S. June '57	STRUCTURAL STEEL 6/57	STRUCTURAL STEEL 6/56	REINFORCING STEEL 6/57	REINFORCING STEEL 6/56	PORTLAND CEMENT 6/57	PORTLAND CEMENT 6/56	First class pine 6/57	First class pine 6/56	Second class pine 6/57	Second class pine 6/56
LATIN AMERICA											
City and Country											
Bogota, Columbia	4.80 Pesos*	2,000*aA*	1,800*aA*	930*aB*	800*aB*	105*a*	92*aC*	.....	.....	5.20*bD*	4.00*b*
Buenos Aires, Argentina	18.00 Pesos	5,500*a*	4,900*a*	4,000*a*	3,460*a*	668*a*	579*a*	45*eE*	46*eE*	40*fF*	43*fF*
Caracas, Venezuela	3.35 Bs	750*ah*	600*ah*	580*ah*	600*ah*	122*ah*	106*ah*	320*ci*	350*ci*	290*ci*	300*ci*
Ciudad Trujillo, Dom. Rep	1.00 RD $	13.00*j*	13.00*j*	9.00*j*	9.00*j*	1.45*k*	1.45*k*	150*l*	150*l*	.....	....
Guatemala City, Guatemala	1.00 Quetzal	.....	.....	9.00*m*	9.00*m*	1.30*nh*	1.30*nh*	.07*ho*	.07*ho*	.06*ho*	.06 *ho*
Havana, Cuba	1.00 Peso	12.00	12.00	9.00	9.00	1.21*q*	1.25*q*	155.00	155.00	155.00	155.00
La Paz, Bolivia	8,000 Bs**	.....	.....	1,250*r*	1,000*r*	14,000*s*	3,075*s*	2,800*tu*	500*tu*	1,800*tu*	400*tu*
Lima, Peru	10.00 Soles	4.80*rv*	3.80*rv*	3.00*r*	3.60*r*	17.52*s*	16.77*s*	4.00*ow*	4.00*ow*	3.80*ow*	3.80*ow*
Mexico City, Mexico	12.50 Pesos	2,100*a*	2,200*a*	2,000*a*	2,100*a*	240*a*	230*a*	2,000	2,000	1,700	1,800
Montevideo, Uruguay	4.14 Pesos	.....	.....	.....	.....	83.00*a*	70.00*a*	550*z*	850*z*	488.68*aa*	670*aa*
Quito, Ecuador	15.15 Sucre***	.....	.....	195*cc*	170*cc*	25*k*	28.70*k*	.....	.....	6*dd*	6*dd*
Rio de Janeiro, Brazil	73.00 Cr $†	12.00*r*	12.00*r*	11.00*r*	11.00*r*	140.00*Gee*	120.00*Gee*	950.00*ffgg*	800.00*ffgg*	1,100.00*ffgg*	900.00*ffgg*
San Juan, Puerto Rico	1.00 dollar	12.00	10.00	8.50	7.00	1.10	1.10	155.00	175.00	125.00	120.00
Santiago, Chile	603 Pesos‡	190,520*a*	180,440*a*	141,080*a*	87,210*a*	18,060*a*	12,800*a*	.....	320,000*ii*	390,000*ii*	400,000*ii*

•*a* per metric ton •*b* local oak, 20x20 cm, per meter •*c* per cu meter •*d* washed, rough; 6/56, half-washed, 7.80; 6/56, rocksand, 5.75 •*e* 3"x4"x1" spruce, per sq meter •*f* 1"x6"x1" spruce, per sq meter •*g* fine sand; coarse sand 6/57, 152.50; 6/56, 135.00 •*h* fob mill •*i* local equivalent, saqui saqui, 6/57 and 6/56, 280 •*j* delivered to job •*k* per 42.5 kg sack •*l* long leaf pine •*m* per quintal, delivered •*n* per 96 pound bag (1 cu ft) •*o* per bd ft •*p* delivered, 6/57, 4.00; 6/56, 3.50 •*q* per sack •*r* per kilo •*s* per 42 kilos •*t* per sq ft •*u* local equivalent, madera mara 6/57, 2,000; 6/56, 380 •*v* heavy; light 6/57, 4.80; 6/56, 4.20 •*w* local equivalent, tornillo, 6/57 and 6/56 3.40 •*x* 1"; 2", 6/57, 32.00; 6/56, 41.00; gravel, 20.00 •*y* per 3 cu meters •*z* pino tea •*aa* pino Brazil •*bb* Granitica •*cc* per 46 kilos •*dd* Eucalyptus, per meter •*ee* per 50 kilo bag •*ff* per dozen, 3x3x4.27 meters long •*gg* local equivalent, Peroba, 6/57, 8,500; 6/56, 6,000 per cu meter for beams 6x12 cm x 5 meters •*hh* crushed stone, 6/57, 400; 6/56, 300 per cu meter (1,600 kls.) •*ii* per 1,000 boards, 1"x10"x12' •* official; 5.75 free; 6/56, official 2.50; 4.60 free •** free rate; 6/56, 7,000-12,000 and official rate 190 per $1, U.S. •*** official; free rate = 17.50 •† 6/56, 83.00 Cr. per $1, U.S. •‡ in banks; free 753 pesos; 6/56, 500 pesos per $1, U.S.

(Continued in column at right)

the World

ties (for which the World Bank provided $90 million in July '57), coal and electric power for industry, plus completion of projects well under way at the present time.

Construction costs have risen steeply, especially since excise duties on steel have been upped 900% and on cement, 300%.

• **Colombo, Ceylon**—The Suez blockade interrupted the flow of cement and steel supplies to Far Eastern countries, creating shortages and lifting prices. However, all classes of building materials in Ceylon are currently in good supply.

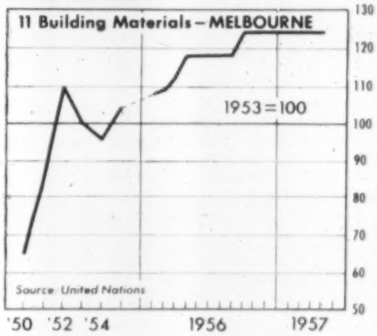
Home construction (fostered by government loans) and public hospital and bridge construction provide the main impetus to current construction activity. New industrial plants also are expected to form part of the government's plans for the next year.

• **Djarkarta, Indonesia**—Construction materials are in short supply. A recently opened (August 1957) cement plant at Gresik marked a major step in the country's redevelopment. It has a capacity of 250,000 tons of cement annually.

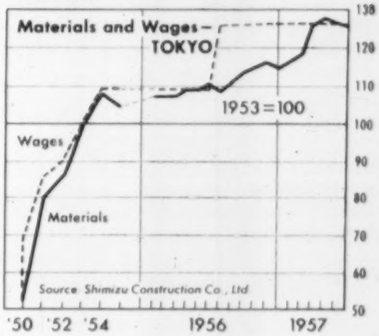
American oil companies are heavy investors in Indonesia, with Caltex (Standard Oil of California and Texas Co.) reported to have initiated a $40-$50 million expansion program to increase oil production facilities by 50%.

Unskilled labor is plentiful; skilled labor is scarce.

AUSTRALIA



JAPAN



• **Karachi, Pakistan**—Basic construction materials such as steel and cement are available in Pakistan generally only at black market prices. Lacking a steel mill, Pakistan must import all steel.

Cement is produced locally, but though the annual output has been doubled since 1948, 1955 production was only 700,000 tons. Moreover, on July 1 the Pakistan government requisitioned nearly all cement production for the next six months.

Lumber supplies have improved,

(*Continued on page 146*)

GRAVEL 1½-in. per ton 6/57	GRAVEL 1½-in. per ton 6/56	SAND per ton 6/57	SAND per ton 6/56
120*cf*	95*cf*	50*c*	45*c*
42/-*fj*	47/-*fj*	55/-*j*	45/-*j*
18/-*g*	16/-*g*	5/-*g*	5/-*g*
120*a*		80*a*	
50/-*Jr*	27/-*r*	30/- *Kr*	15/-*r*
6.50*t*		1.50*t*	
6.00 *Nc*	4.95 *Nc*	5.00*Oc*	4.50*Oc*
1/13/3*t*	1/14/9*t*	1/17/-*t*	1/14/-*t*
450*c*	420*c*	120*c*	110*c*
41/6*g*	40/7*g*	7/-*gg*	7/-*gg*
9,100*u*	7,200*u*	5,500*u*	4,800*u*

Ranges *(continued)*
• *K* 26/- to 30/- •*L* 6/57, 5.20-5.50; 6/56, 5.50-5.80 •*M* Red Luan local equivalent, 6/57 and 6/56, 250-275 • *N* 6/57, 5.50-6.00; 6/56, 4.50-4.95 •*O* 6/57, 4.50-5.00; 6/56, 4.05-4.50 • *P* 6/57, 15/10/- to 19/16/-; 6/56, 13/15/- to 18/10/6 •*Q* 6/57, 8/6/6-9/1/9; 6/56, 8/9/- to 9/2/6

17.00*c*	15.50*c*	14.00*c*	13.50*cd*
260*c*	230*c*	62*cg*	47*cg*
16*c*	16*c*	18*c*	18*c*
3.70*c*	2.75*c*	2.00*c*	2.00*c*
2.75*chp*	2.50*chp*	2.00*cj*	2.00*cj*
2.80	2.80	5.50*c*	5.50*c*
32,000*c*	8,500*c*	32,000*c*	8,000*c*
41.00*cz*	43.00*cz*	21.00*c*	25.00*c*
82.00*y*	80.00*y*	77.00*y*	75.00*y*
16.50*abb*	10.00*abb*	3.60*a*	2.70*a*
50*c*	45*c*	28*c*	28*c*
350*c*	270*c*	260*chh*	240*chh*
3.75*cj*	3.65*cj*	2.55*cj*	2.60*cj*
1,550*cj*	1,400*cj*	1,550*cj*	1,400*cj*

Ranges: *A* 6/57, 1,200-2,000; 6/56, 1,000-1,800
B 6/57, 850-930; 6/56, 700-800
C 6/56, 88-92
D 4.20-5.20
E 6/57, 43-45; 6/56, 45-46
F 6/57 39-40; 6/56 41-43
G 6/57 90-140

—Worldwide Construction Labor Rates—

Labor Rates per Hour, June '57 and '56 (in national currency)

		COMMON LABOR				SKILLED LABOR					
		Heavy Construction		Building		Bricklayers		Carpenters		Structural Iron workers	
		6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56
ASIA AND AUSTRALIA											
City and Country											
Bangkok, Thailand	*a*	20.00	15.00	30.00	25.00	70.00	70.00	70.00	60.00	40.00	35.00
Bombay, India	*a*	-/8/-	-/8/-	-/6/-	-/6/-	-/12/-	-/12/-	-/12/-	-/12/-	1/4/-	1/4/-
Colombo, Ceylon	*ab*	0.37	0.37	0.37	0.37	0.46	0.46	0.46	0.46	0.46	0.46
Djakarta, Indonesia	*c*	4.00	3.50	3.00	2.75	4.00	3.50	4.00	3.50	4.00	3.50
Karachi, Pakistan	*a*	-/8/-	-/8/-	-/6/-	-/6/-	1/2/-	1/-/-	1/2/-	1/-/-	1/2/-	1/-/-
Kuala Lumpur, Malaya	*a*	7.50		7.00		8.00*A*		8.00*A*		8.50*B*	
Manila, P.I.	*a*	.50	.50	.50	.50	1.25*C*	1.25*C*	1.25*D*	1.25*D*	1.25*C*	1.25*C*
Melbourne, Aust.	*ad*	23/10/8*E*	22/18/4*E*	23/10/8*E*	22/18/4*E*	25/2/5	24/6/11	24/6/10	23/13/1	20/15/3*F*	20/1/9*F*
Saigon, Vietnam	*a*	10*G*	8*G*	8*H*	7*H*	15*I*	12*I*	16*I*	12*J*	15 *K*	12 *K*
Sydney, Australia	*ae*	-/7/11¼		-/7/11¼		-/9/3½		-/9/5½			...
Tokyo, Japan	*a*	79.00	66.00	66.00	54.00	100.00	84.00	93.50	77.50	100.00	81.00

•*a* 8 hr day •*b* minimum rates set by State Wage Boards. Includes cost of noonday meal •*c* 7 hr day •*d* per 40 hr week. Includes paid holidays, statutory additions, and unofficial additions •*e* 5 day 40 hr week
Ranges: •*A* 7.50-8.00 •*B* 8.00-8.50 •*C* .75-1.25 •*D* .625-1.25 •*E* 6/57, 19/14/- to 23/10/8; 6/56, 19/-/6 to 22/18/4 •*F* 6/57, 13/14/6 to 20/15/3; 6/56, 12/18- to 20/1/9 •*G* 6/57, 7-10; 6/56, 6-8 •*H* 6/57, 6-8; 6/56, 6-7 •*I* 6/57, 11-15; 6/56, 10-12 •*J* 6/57, 13-16; 6/56, 10-12 •*K* 6/57, 12-15; 6/56, 10-12

LATIN AMERICA											
City and Country											
Bogota, Columbia	*ab*	3.50*A*	3.12*A*	3.50*A*	3.12*A*	1.88*B*	1.20	1.95	1.26	......	1.26
Buenos Aires, Arg.	*abcde*	60.00	45.10	60.00	45.10	80.00	56.60	80.00	56.50	80.00	54.60
Caracas, Venezuela	*aef*	14.00	14.00	14.00	11.70	23.30*C*	29.20*C*	23.30*C*	29.20*C*	29.20	25.70*D*
Ciudad Trujillo, Dom. Rep.	*ae*	2.00	2.00	2.00	2.00	2.40*g*	2.00*g*	5.00*E*	5.00*E*	5.00*F*	5.00*F*
Guatemala City, Guat.	*a*	0.160	0.12	0.12	0.10	0.25	0.16	0.32	0.25		
Havana, Cuba	*a*	0.550	0.55	0.52	0.52	0.83	0.83	0.83	0.83	1.18	1.18
La Paz, Boliva	*a*	2,10*j*	1,043	750	388	1,600	865	1,900	954	2,000	1,000
Lima, Peru	*ai*	45.9*k*	48.75	41.35	40.50	61.20	60.00	61.20	60.00	68.85	60.00
Mexico City, Mexico	*a*	1.38	1.19*j*	1.38*j*	1.19*j*	2.48	2.50	2.48	3.00	3.77	3.80
Montevideo, Uruguay	*a*	2.00	1.49*l*	1.89*k*	1.36*l*	2.34*k*	1.70*l*	2.34*k*	1.70*l*		
Quito, Ecuador	*c*	90	90	70	70	140	140	105	105	220	140
Rio de Janeiro, Brazil	*a*	17.00	12.00	16.00	10.00	19.00	15.00	21.00	18.00	27.00	24.00
San Juan, Puerto Rico	*a*	0.67	0.50	0.63	0.50	1.07	1.00	1.02	0.90	1.45	1.25
Santiago, Chile	*am*	95.00	95.00	85.00	85.00	140.00	128.00	140.00	128.00	152.50	135.00

•*a* 8 hr day •*b* includes 44% markup for social insurance •*c* 44 hr week •*d* plus 82.5% for workmen's insurance and other social charges; 6/56, plus 80% •*e* rates per day •*f* includes 7th day pay and 15 days per year vacation •*g* per 100 bricks •*h* includes social benefits •*i* includes social insurance, unemployment tax, indemnity reserve, vacations, etc. •*j* peons •*k* plus social benefits payments •*l* excludes social benefits payments •*m* includes social charges, 52%
Ranges: •*A* 6/57, 0.66-3.50; 6/56, 0.38-3.12 •*B* 1.20-1.88 •*C* 6/57, 21-23.30; 6/56, 23.30-29.29 •*D* 6/56, 21-25.70 •*E* 6/57, 6/56, 3.50/4.50-5.00 •*F* 6/57, 6/56, 3.00-5.00

. . . World price trends

(*Continued from page 145*)

though prices have increased substantially. Oil drilling around Karachi has pushed sand and gravel sources farther from building sites with a doubling of prices. Other building items, like glass, sanitary and electric fittings are likewise short of the rising demand and available as a rule only at blackmarket prices. Local labor is cheap, but wage rates are rising.

• **Kuala Lumpur, Malaya**—In this newest of the new independent nations, a Five Year Plan promises immense possibilities for investors and contractors. The Cameron Highland hydro scheme—to cost $97 million for the first stage (1957-61) and $78 million for the second stage (1962-68)—already has been launched.

• **Manila, Philippine Islands**—Despite the advent of a new 10,000 bags per day cement plant of the Republic Cement Corp., the supply is still tight in the Philippines. Reinforcing bars are limited in quantities and sizes.

There is plenty of unskilled labor, but contractors must train new men on the job for skilled occupations.

• **Melbourne and Sydney, Australia**—Australia's £400 million ($900 million) Snowy River Project, on which American, Italian, Norwegian and French contractors are engaged, will require 17 hydroelectric power stations generating 3 million kw and will provide nearly 2 million ac-ft of water for irrigation of 400,000 acres of land.

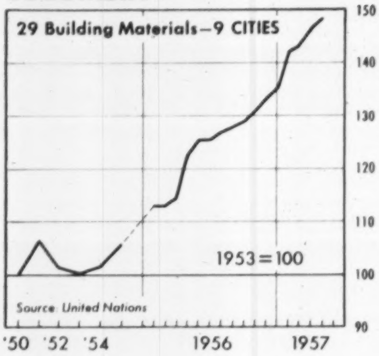
Cement production in Australia is reaching record levels under the impetus of public and private construction programs. This year's output is estimated at over 2 million tons.

• **Saigon, Vietnam**—While building materials are in good supply in Vietnam, construction activity is hampered by climate, political difficulties and financial limitations. American aid is running at $300 million a year, but is being shifted to aid for specific projects like the $75 million highway linking Saigon with the cities and provinces to the north and east.

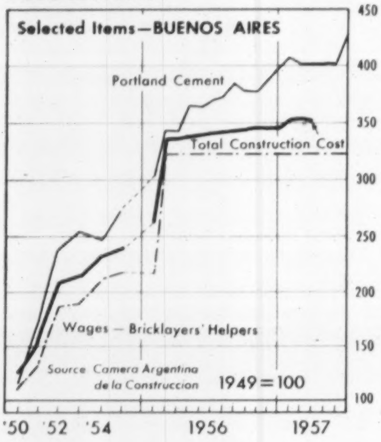
Unskilled labor is plentiful.

• **Tokyo, Japan**—Japan now is facing the effects of a tighter money policy. Demand for construction materials and labor is declining under the government's efforts to curb capital investment. In May, the Bank of Japan's discount rate went to 8.4%, and in June, the bank ordered nine leading commercial banks to cut their proposed lending for the month from $138.8 million to $61.1 million.

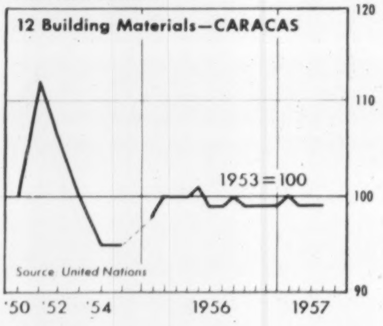
COLOMBIA



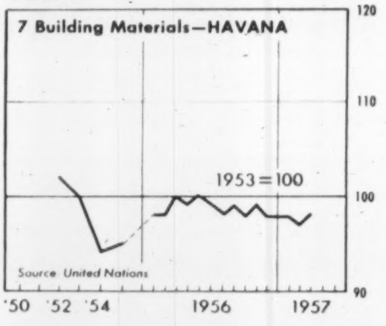
ARGENTINA



VENEZUELA



CUBA



Latin America

Countries south of the border are checking rapid industrial expansion because unfavorable trade balances threaten currency stability. Building materials are becoming increasingly available and labor more plentiful, except for skilled classes. But the backlog of projects continues to mount, and when funds become available, the Latin countries will forge ahead with construction.

• **Bogota, Colombia**—Political and financial adjustments beset Colombia. The austerity program required to balance foreign trade is curbing construction imports, especially of piping for sanitary installations, air conditioning equipment, electrical materials, and glass.

Construction activity on roads, railroads, and power plants is being halted temporarily for essential projects, and permanently for those deemed unessential or uneconomic.

• **Buenos Aires, Argentina**—Argentina is in the midst of a big private industry building boom. Emphasis is on homebuilding.

Building costs are soaring, particularly following a substantial wage boost in October, 1956 made retroactive to February 1, 1956. Skilled labor is very scarce; unskilled labor is generally in fair-to-good supply.

With the exception of lumber prices, building material prices are from 12% to 32% higher than last year. Overall construction costs in Buenos Aires were 4.8% higher in March, 1957 than a year ago, but this follows a 29% jump between January and March, 1956, after the higher wage rates went into effect.

Argentina is negotiating for construction of a huge oil pipeline and refinery project, estimated to cost about $270 million. American and Argentine companies are jointly interested in the job

• **Caracas, Venezuela**—Venezuela construction is booming. This year may set a record, partly because huge public projects are under way and partly because oil companies are expanding pipeline, terminal, refinery, and harbor facilities.

A crash program in public housing to finish the last of 59 apartment houses, 15 shopping centers, and 10 miles of paved and lighted streets by Dec. 2 is approaching completion under three shifts a day and floodlights.

In addition, Venezuela has boosted the value of its huge Orinoco integrated iron and steel mill now under construction from $200 million to $343 million and lifted annual ingot capacity from 464,000 to 770,000 tons.

Some $7 million of a contemplated $50 million already has been spent for constructing 25 buildings for Venezuela's atomic research center. Ten years will be required to complete the center.

• **Guatemala City, Guatemala**—Construction in Guatemala City is running 50% ahead of last year. American contractors are employed for highways, but local contractors have all other types of work. Construction materials are in fairly good supply, but prices are high Labor is plentiful and cheap but efficiency is low.

• **Havana, Cuba**—Despite political difficulties, which have had some impact on construction activity in Cuba since March, 1957, American companies are continuing to invest in new plants on the island. Freeport Sulphur announced in August it had completed financing a $100 million nickel mining project for southeast Cuba. DuPont will build a paint plant near Havana, and a modern petroleum refinery is contemplated for the north of Cuba by Cuban and U. S. interests.

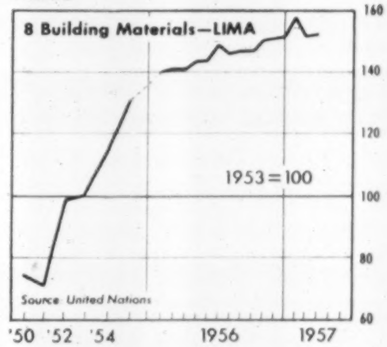
• **LaPaz, Bolivia**—Bolivia's private construction is 40% below last year, but public construction is slightly above the 1956 level. However, those with faith in the Bolivian Stabilization Plan believe the country is on the threshold of important construction activity. Governmental control over materials has been abandoned with the result that supplies are good, but prices are high. Labor is plentiful; in fact, there is some unemployment.

• **Lima, Peru**—Public construction has faltered this year, but private construction continues at a good rate. Materials are in good supply, with no restrictions on imports. Lima labor is plentiful, but the provinces, where activity is greater, report shortage of some skills.

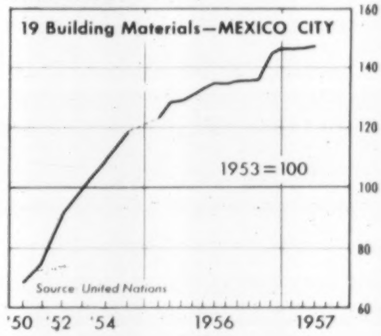
• **Mexico City, Mexico**—Despite drought, hurricanes, and earthquakes, Mexico expects construction activity to expand in 1957 as it has done each year since 1953. Tourists are pressing for new hotels, stores, and services; industrialization is forcing new factory structures to be built; and political pride is egging the outgoing president to complete as many public projects as possible before his term ends Dec. 1, 1958. A slowdown in construction is expected for a time after the new president is inaugurated.

All materials but structural steel and reinforcing steel are in good supply. But a buyer's market may turn up in 1959. Unskilled labor is adequate in supply, poor in quality. Skilled labor is good in quality.

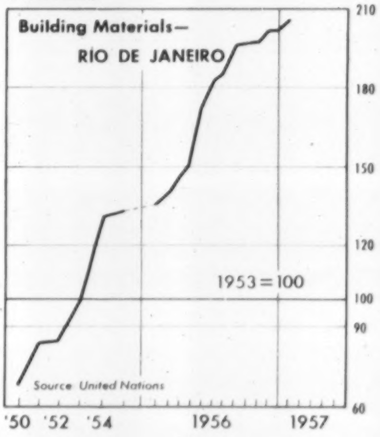
PERU



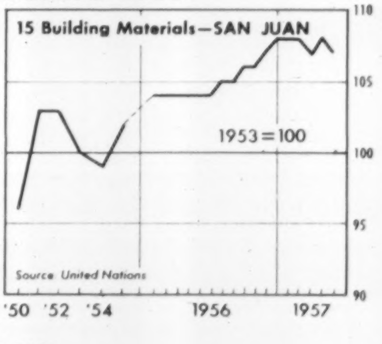
MEXICO



BRAZIL



PUERTO RICO



• **Montevideo, Uruguay**—Construction materials in Uruguay are in good supply with prices up 20% compared with 1956.

Construction activity is below last year for both public projects and industrial building. Both skilled and unskilled labor are in good supply.

• **Quito, Equador**—Construction activity in Quito this year is on a par with 1956, but a step-up in building activity is expected for 1958 because the Inter-American Conference will convene in Quito in 1959.

Both materials and labor are in adequate supply.

• **Rio de Janeiro, Brazil**—Brazil has a super construction program planned for the next few years whose execution is hampered by lack of funds. However, construction on its new capital city of Brasilia in the midst of the jungle north of Rio de Janeiro is under way.

In August, Rio approached Brown & Root of Houston, Texas, on a $100 million project involving removal of Santo Antonio Mountain in the heart of the City, construction of highways, tunnels, and possibly water and sanitary systems.

Materials and labor are in good supply, in part because of some slackening in over-all construction activity. Apartment house and office building construction is below the 1956 level as a result of financing difficulties.

• **San Juan, Puerto Rico**—Construction put in place for fiscal 1957 in Puerto Rico is expected to top $165 million, a 16% increase over the $142 million of fiscal 1956. Industrial and commercial private construction will reach $41 million this year against $36 million in 1956 and $28 million in 1955. In addition, various public authorities will nearly double their construction of sewers, electric energy, port development projects, and airport improvements.

But tight money is curtailing both private and public residential construction. However, the Rockefeller 4,000 unit, $40 million housing project is just getting rolling and financing is reported available for a $46 million, 5,150 unit middle class housing project.

• **Santiago, Chile**—The worldwide drop in copper prices has hit Chile hard. The construction industry has accordingly slumped. There is a surplus of materials and some labor, though skilled workers are still hard to obtain. Nevertheless prices of construction materials are continuing upward, though wage rates have leveled off in 1957, after setting a new high in March.

(Continued on page 148)

. . . World price trends

(Continued from page 147)

Europe

European countries are curbing their booming construction activities to offset inflationary pressures. Interest rates are rising; imports are being curtailed by foreign exchange shortages and by governmental edict. Material and common labor supplies are easing. Yet prices and labor rates continue to move up.

• **Aachen, West Germany**—Though West Germany has enjoyed one of the most prosperous postwar years, construction activity is running below the 1956 level. Uncertainty over the presidential election and limited capital curbed activity early this year, but large projects are under consideration. The West German federal bank has cut its interest rate three times from 5½% in August 1956 to 4% in September 1957.

Materials are in good supply, as is labor, with the exception of skilled labor. West Germany is the third largest cement producer in the world, ranking behind the U. S. and Russia.

• **Amsterdam, Netherlands**—Austerity has been proclaimed for the Netherlands to halt the flight of the Dutch guilder to the German mark. The end of cheap money came in July when the Dutch bank rate was boosted from 3¾% to 4¼%. However, 1957 construction is expected to surpass the 1956 level by about 25%, with emphasis on home construction.

Restrictions on construction of some types of building have eased material supplies. Construction labor is still fully employed, with scarcities evident among skilled trades, such as masons, carpenters, and whitewashers.

• **Athens, Greece**—A building boom is on in Greece, destined to erase the ravages of guerrilla warfare of the 1940's and to modernize Athens and Salonika.

Worldwide Construction Materials Prices

Materials Prices, fob City and Country, June '57 and '56 (in national currency)

(Continued from page 145)

EUROPE

City and Country	OFFICIAL EXCHANGE per $1 U.S. June '57	STRUCTURAL STEEL per cwt		REINFORCING STEEL ¾ to 1-in., per cwt		PORTLAND CEMENT per bbl		LUMBER, 2x4, S4S, per Mfbm First class pine		Second class	
		6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56
Aachen, West Germany	4.20 DM	53.10a	50.10a	53.80ab	50.80ab	720.00c	685.00c	240.00d	240.00d	220.00de	220.00de
Amsterdam, Netherlands	3.82 f	535.00a	513.35a	528.50a	502.50a	61.50a	55.50a			234.00df	229.00df
Athens Greece	30 Dr	8.60Ag	6.70g	5.50g	5.40g	620a	610a	2,800d	2,700d	2,300dh	2,500dh
Bonn, West Germany	4.19 DM	456a	441a	462a	452a	74.50a	73.00a	285d	250d	250di	235di
Brussels Belgium	50.25Bfr	5,835aj	5,400aj	5,600aj	5,350aj	727ak	659ak	37.00lm	38.00lm	33.00ln	32.50ln
Copenhagen, Denmark	6.89 Dkr			982aq	922aq	21.37qr	19.89qr	19.00qst	19.05qst	15.95qst	16.01qst
Dublin, Ireland	7 s	63/-/-w	63/-/-w	56/-/-w	52/10/-w	7/8/9w	6/5/[illegible]	-/13/1x	-/12/10x	-/14/8½y	-/14/5½y
Geneva, Switzerland	4.32 Sw fr	78.00qaaB	79.00qaaB	82.50qaaC	82.50qaaC	5.40qbb	5.40qbb	250.00qd	260.00qd		
Helsinki, Finland	231 Fmk	56g	54g	55g	52g	403bb	392bb			76.0.0ee	77.0.0ee
Lisbon, Portugal	28.60 Esc	4.50g	4.50g	4.50g	4.50g	1,000d	1,000d	1,400d	1,400d	900d	900d
London, England	7 s 2d	39/11/6zff	33/16/6zff	37/4/0zgg	35/9/0zgg	5/4/6zhh	5/-/-zhh	140iiD	130iiD	102iiE	105iiE
Madrid, Spain	42 P	6,861aFll	4,775aFll	5,175amm	5,214amm	694.00ann	456.89a	4,500d	3,050d	3,500d	2,675d
Oslo, Norway	7.11 N kr	48.5oopp	48.5oopp	48.5ppqq	48.5ppqq	130.0arr	120.0arr	1,600ss	1,490ss	1,460ss	1,280ss
Paris, France	350 fr	62,660aq	59,114aq	57,200aqtt	53,810aqtt	8,712aq	7,815aq	38,218duu	34,334duu	28,103duu	26,604duu
Rome, Italy	624.80 Lit	10,000ww	8,300xx	9,100xxI	7,150xx	1,060qxx	1,060qxx	42,000dyy	35,500dyy	38,000dyy	34,000dyy
Stockholm, Sweden	5.167 S kr	860aq	760aq	767.50aq	722.50aq	98.40a	96.60a	2.71†	2.42†	1.33†	1.33†
Vienna, Austria	26 S	375xx	375xx	350xx	350xx	480.50a	480.50a			1,080d	1,080d
Zurich, Switzerland	4.32 Sw fr	140xx	150xx	100xx	105xx	607c	650c	1.70†	1.85†	1.50†	1.60†

•a per metric ton •b 1-in. diam •c per 10 metric tons •d per cu meter •e local equivalent, 6/57 and 6/56, 190.00 •f local equivalent •g per kilo •h local equivalent, 6/57, 1,900 6/56, 1,700 •i local equivalent, 6/57, 230.00; 6/56, 210.00 •j add freight from basing point •k by barge •l 2½x7" running meter •m Scandinavian •n domestic •o crushed 8/22 mm fob barge on Meuse •p fob quarry •q delivered •r per 4 bags—170 kgs •s per cu ft •t imported, 1½x6 •u 1500–1600 kgs •v 1500 kgs approx •w per ton •x imported white deal, per ft •y imported red deal, per ft •z per long ton •aa carlots •bb per 50 kg bag •cc delivered, 6/57, 13.50; 6/56, 14.50 •dd delivered, 6/57 and 6/56, 15.50 •ee basic price per std for 7" unsorted redwood f.a.s. S. Finnish port •ff manufacturer's price; merchant's price, 6/57, 52/-/-; 6/56, 48/4/6 •gg manufacturer's price; merchant's price, 6/57, 40/-/-; 6/56, 38/-/- •hh merchant's price •ii per 165 cu ft •jj per cu yard •kk outside London, 6/57, -/20/6; 6/56, -/19/4 •ll black market, 6/57, 14,000; 6/56, 6,750 •mm black market, 6/57, 12,500; 6/56, 7,300 •nn black market 1,200 •oo wholesale; mill price 44.0, dip and dimmel •pp add 1.35 for 10 and 13 mm; 3.80 for 6 mm •qq deformed; round steel, 44.0 •rr 6.85 per 50 kg sack; 6/56, 6.25 •ss per 4.672 cu meter = 165 cu ft, planed •tt 2/5"; ¾" slightly cheaper •uu 1x3 1/5 Vosges •vv coarse; fine 6/57, 2,424; 6/56, 2,182 •ww per 100 kilos, 80mm x100mm, 9,800–10,000; 600mm x 600mm, 10,800–11,000 •xx per 100 kilos •yy fir, 4m lengths •zz 2-3 cm; 5 cm, 6/57, 1,500; 6/56, 1,650 •† per meter

AFRICA AND MIDDLE EAST

City and Country	OFFICIAL EXCHANGE per $1 U.S. June '57	STRUCTURAL STEEL per cwt		REINFORCING STEEL ¾ to 1-in., per cwt		PORTLAND CEMENT per bbl		LUMBER, 2x4, S4S, per Mfbm First class pine		Second class	
		6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56
Ankara, Turkey	a 2.80 T£	1,406.24b	1,110.70b	750.47bc	650.50bc	118.00bd	97.00bd	450.00e	390.00e	350.00ef	320.00ef
Bagndad, Iraq	357Fils	65g	70gA	60g	72gB	7½g	7½g	50eh		30ei	
Beirut, Lebanon	3.19 L£	0.70Cj	0.55j	0.435j	0.45Dj	63.50b	63.50b	235.00ek	235.00ek	190.00el	190.00el
Cairo, Egypt	34.643 P	120bE	90bE	55b	55b	5.50b	5.50b	33	33	31	28
Casablanca, Morocco	350 Fr	64,900b	58,800b	59,000bm	53,300bm	7,010n	6,900n	28,300e	27,802eo	25,100eo	23,683eo
Durban, Natal	-/7/2 £	120/-gpF	120/-gpF	-/45/6q	-/39/6q	-/6/2r	-/5/10r	-/30/-st	-/24/-s	-/16/-su	-/15/6su
Jerusalem, Israel	1.80 I£			460b	410b	85b	85b			215e	215e
Salisbury, No. Rhodesia	-/7/1 £	95/-/-g		63/-/-g		-/9/1vw		-/1/5x		-/11/¼y	
Salisbury, So. Rhodesia	-/7/1 £	95/-/-g	95/-/-g	63/-/-g	60/-/-g	-/8/4½vee	-/8/4½vaa	-/14/-x	-/13/9x	-/11/1y	-/10/3½y
Tel Aviv, Israel	1.80 I £	550bbb	550bbb	475b	450b	84b	84b	450e	450e	255ecc	255ecc

•a fob job site •b per metric ton •c 12m m-40m m •d produced in Turkey •e per cu meter •f local equivalent, uncut logs, 6/57, 175; 6/56, 150 •g per short ton •h Canadian clear •i White deal •j kilograms •k Swedish fir, any size •l Whitewood, any size •m 3/12mm diam. •n bulk, fob mill •o import; local cedar 6/57, 21,700; 6/56, 19,564 •p heavy steel •q 1" made locally, delivered Durban; ¾" freighted from Transvaal, 6/56, -/42/6 •r per 94-lb bag, delivered •s per cu ft •t clear Oregon; deal, 6/57, -/16/-; 6/56, -/17/6 •u mercantile Oregon; S.A. pine, -/11/6 to -/12/9 •v per cu yd for concrete; for plaster, 6/57 and 6/56, -/10/6 •w small quantity; large quantity, -/8/6 •x clear Oregon pine, per running foot 1½"x4½" •y merchantable Oregon pine, per running foot, 1½"x4½" •z river •aa for large quantities, 6/57, -/7/6; 6/56, -/7/3 •bb imported •cc European spruce, 6/57 and 6/56, 230

NORTH AMERICA (including U. S. possessions)

City and Country	OFFICIAL EXCHANGE per $1 U.S. June '57	STRUCTURAL STEEL per cwt		REINFORCING STEEL ¾ to 1-in., per cwt		PORTLAND CEMENT per bbl		LUMBER, 2x4, S4S, per Mfbm First class pine		Second class	
		6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56	6/57	6/56
Anchorage, Alaska	$1.00	10.00a	9.00a	9.45ab	7.82a	8.05c	8.05c	135.00d	135.00d	135.00de	135.00de
Calgary, Canada	$0.953	10.10i	9.65i	9.40i	9.40i	5.00	5.00	125.00d	130.00d	118.00d	123.00d
Honolulu, Hawaii	$1.00	7.80k	7.00k	7.40l	6.75l	4.98m	4.83m	175.00n	171.00n		
Montreal, Canada	$0.953	9.00A	8.15A	9.95B	8.65B	2.86	2.86	94.00o	100.00o		
New York, USA		9.01	8.21	7.80q	7.35	4.38	4.00	117.00p	127.00p		
Ottawa, Canada	$0.953	11.00C	11.00C	11.00C	11.90C	5.00	4.84	265.00S	265.00S	200.00t	200.00t
San Francisco, USA		9.15	8.55	9.10	7.55	3.54	3.59	84.00du	91.00du		
Toronto, Canada	$0.953	8.75r	8.40r	7.60	7.25	4.03	3.77	95.00o	106.00o		
Winnepeg, Canada	$0.958	10.50	9.25	8.75w	8.35w	1.20z	1.17z	100.00o	100.00o	95.00o	95.00o

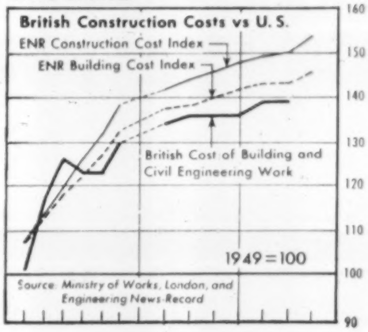
•a fob dock, Seattle •b detailed and bent •c bulk, fob Anchorage; in paper bags, fob Seattle 6/57, 4.35; 6/56, 4.29 •d Douglas fir •e spruce, 6/57 and 6/56, $125 Mfbm •f per cu yd •g delivered to job •h winter price, 6/57 and 6/56, 7.00 •i per short ton •j fob pit •k import price; local stocks, 6/57, $9.75; 6/56, $8.50 •l import price; local stocks, 6/57, $8.10; 6/56, $8.00 •m bulk; sack, 6/57, $5.48; 6/56, $5.33 •n Douglas fir, construction grade, mixed with 15% to 20% standard grade •o spruce •p truck lots delivery •q 10-20 M lbs, add 35¢ for delivery •r barge lots, dockside •s No. 1 and 2 common •t No. 3 common •u mill price, includes freight •v average of Canadian and American •w 1" diam; ¾" diam 6/57, $9.00; 6/56, $8.50 •z per 87½ lb bag (4 bags = 1 bbl)

Both materials and labor are in good supply.

•Brussels, Belgium—Belgium's construction industry has been swamped with public projects this year, partly in connection with the 1958 Brussels Exposition and partly for road construction. In September '57, Belgium borrowed $30 million in the U. S. market to finance the country's extraordinary public works program, including modernization of the canal system, port improvements at Antwerp, construction of school and university buildings, improvements to the Malsbroeck commercial airport at Brussels, and expan-

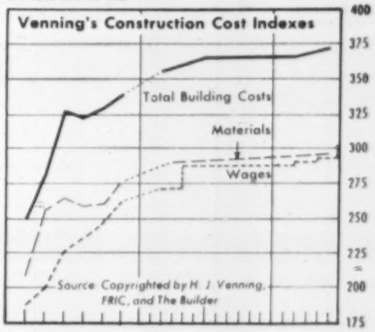
(*Continued on page 152*)

ENGLAND



Source: Ministry of Works, London, and Engineering News-Record

ENGLAND



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Worldwide Construction Labor Rates

Labor Rates per Hour, June '57 and '56 (in national currency)

GRAVEL 1½-in. per ton 6/57	GRAVEL 6/56	SAND Per ton 6/57	SAND 6/56
6.10*a*	5.55*a*	6.15*a*	5.60*a*
8.13*a*	7.67*a*	5.85*a*	5.32*a*
50*d*	45*d*	55*d*	52*d*
6.50*d*	8.50*d*	9*d*	10*d*
110.00*ao*	105.00*ao*	36.50*ap*	36.50*ap*
......	16.50*du*	......	7.75*vp*
......	-/12/*oz*	......	-12/*oz*
10.00*dcc*	10.50*dcc*	10.50*ddd*	10.50*ddd*
1,150*dq*	1,150*dq*	770*dq*	750*dq*
75*a*	75*a*	75*a*	75*a*
-/23/6*jj*	-/23/-*jj*	-/26/-*jjkk*	-/24/3*jjkk*
120*d*	45.50*d*	70.00*d*	36.00*d*
16.00*jjG*	16.00*jjG*	11.50*jjH*	11.50*jjH*
2,695*d*	2,384*d*	2,418*dvv*	2,132*dvv*
1,600*dqzz*	1,850*dqzz*	950*dq*	970*dq*
13.20*dJ*	12.25*dJ*	12.20*dK*	11.25*dK*
36*d*	36*d*	40*d*	40*d*
16.10*d*	18.90*d*	21.00*d*	24.50*d*

Ranges: •*A* 8.00–8.60 •*B* 6/57, 70–78; 6/56, 71–79 •*C* 6/57 and 6/56, 70.50–82.50 •*D* 6/57, 115–140; 6/56, 110–130 •*E* 6/57, 97–102; 6/56, 95–105 •*F* 6/57, 4,601–6,861; 6/56, 3,070–4,775 •*G* 6/57 and 6/56, 11.10–16.00 •*H* 6/57 and 6/56, 6.70–11.50 •*I* 8,900–9,100 •*J* 6/57, 12.20–13.20; 6/56, 11.25–12.25 •*K* 6/57, 11.20–12.20; 6/56, 10.25–11.25

13.00*e*	10.00*e*	13.00*e*	10.00*e*
2*b*	1.5*b*	1.5*b*	0.750*b*
7.00*e*	7.00*e*	4.00*e*	4.00*e*
75*e*	75*e*	35*e*	35*e*
700*e*	700*e*	250*e*	250*e*
-/15/-*v*	-/13/-*v*	-/5/-*v*	-/5/-*v*
4.257*e*	3.814*e*	1.813*e*	1.538*e*
-/23/-	......	-/21/-*z*	......
-/27/6	-/30/-	-/13/-*z*	-/15/-*z*
4.600*e*	4.150*e*	2.000*e*	1.800*e*

Ranges: *A* 65–70
B 70–72
C 0.48–0.70
D 0.40–0.45
E 6/57, 80–120; 6/56, 65–90
F light, 6/57, 85/- to 100/-; 6/56, 80/- to 95/-

5.00*fgh*	5.00*fgh*	5.00*fgh*	5.00*fgh*
1.90*fj*	1.50*fj*	3.75*fj*	3.25*fj*
2.80	2.80	4.00	4.00
1.95*p*	1.95*p*	2.25*p*	2.25*p*
3.05*fr*	3.05*fr*	2.30*fr*	2.00*fr*
1.80	2.00	1.20*D*	1.50
2.02	2.02	2.12	2.12
2.40*g*	2.25*g*	2.05*g*	1.85*g*
3.75*f*	3.75*f*	3.75*f*	3.75*f*

Ranges: *A* 6/57, 8.25–9.00; 6/56, 7.70–8.15
B 6/57, 7.75–9.95; 6/56, 7.50–8.65
C 6/57, $10–$11; 6/56, $9–$11
D 1.00–1.20

EUROPE

City and Country	COMMON LABOR Heavy Construction 6/57	6/56	Building 6/57	6/56	SKILLED LABOR Bricklayers 6/57	6/56	Carpenters 6/57	6/56	Structural Ironworkers 6/57	6/56
Achen, West Germany *ab*	2.11	1.91	2.11	1.91	2.42	2.20	2.42	2.20	2.31	2.14
Amsterdam, Nthlds *c*	....	....	2.321	2.215	2.321	2.215	2.321*d*	2.215*d*	2.157	2.136
Athens, Greece *e*	120*A*	110*A*	80	65*B*	150*C*	140*C*	150*D*	150*D*	140*E*	130*E*
Bonn, W. Germany *a*	2.24	2.12	2.15	1.95	2.46	2.24	2.46	2.24	2.35	2.24
Brussels, Belgium *efg*	29.50*F*	27.50*F*	26.20*G*	24.50*G*	32.70*H*	30.50*H*	32.70*H*	30.50*H*	32.70*H*	30.50*H*
Copenhagen, Denmark *e*	6.21*h*	5.63*i*	6.21*h*	5.63*i*	7.69*j*	6.97*k*	7.25*l*	6.61*k*	....	....
Dublin, Ireland *m*	-/155/4*n*	-/155/4*n*	-/3/7½	-/3/6	-/4/3½	-/4/2	-/4/3½	-/4/2	-/150/6*n*	-/159/6*n*
Geneva, Switzerland *e*	2.78	2.68	2.78	2.68	3.40	3.20	3.42	3.27	3.40	3.20
Helsinki, Finland *op*	220	207*q*	220	207*q*	390	351*q*	330	307*q*	420	349*q*
Lisbon, Portugal *e*	4.00	4.00	4.00	4.00	5.00	5.00	6.25	6.25	7.50	7.50
London, England *e*	-/3/13	-/3/10½	-/3/13	-/3/10½	-/4/7½	-/4/5	-/4/7½	-/4/5	-/4/5½	-/4/3
Madrid, Spain *er*	4.50	2.99	4.50	2.99	6.35	4.75	6.35	4.75	5.93	3.50
Oslo, Norway *cs*	8.17	7.43	6.96	6.06	8.12	7.34	7.14	6.14	....	....
Paris, France *et*	229	194.2	229	194.2	394	349.8	348	310.2	360	328.3
Rome, Italy *eu*	309.00	304.00	309.00	304.00	346.00	340.00	380.00	374.00	....	374.00
Stockholm, Sweden *c*	7.30	7.00	7.30	7.00	9.40	9.00	9.40	9.00	7.30	7.00
Vienna, Austria *e*	7.00	6.75	7.00	6.75	8.10*V*	7.80*v*	8.40*v*	8.10*v*	7.65	7.40
Zurich, Switzerland *tw*	5.50	5.00	5.50	5.00	6.00	5.30	5.70	5.50	5.60	5.60

•*a* 9 hr day •*b* add unemployment insurance, 0.04 per hour •*c* 8½ hr day •*d* includes 0.02 f per hr compensation for own tools •*e* 8 hr day •*f* 6 day week •*g* linked to cost of living plus extra 41.9% social security paid by contractors for 1957; +40.5% (rev.) for 1956 •*h* 4th Q 1956; 3rd Q 1956, 5.94 •*i* 3rd Q 1955; •*j* 4th Q 1956; 3rd Q 1956, 7.34 •*k* 3rd Q 1955 •*l* 4th Q 1956; 3rd Q 1956, 6.98 •*m* 44 hr week •*n* per week •*o* 46½ hr week except May-September 45 hrs •*p* hourly earnings based on piece rates •*q* 2nd Q 1956 •*r* add 14.5%, social security; 5% insurance; 20% of total payroll for family bonus; 1.5% to 12%, workmen's compensation; 8 to 10 days vacation with pay; 4 to 5 days off for family reasons; pay for Sundays and 12 holidays; two bonuses a year, each for 10 to 15 days' wages; and profit-sharing bonus •*s* 48 hr week •*t* includes social charges •*u* includes social insurance, paid holidays and other social charges •*v* includes 0.10 tool compensation for bricklayers; 0.25 for carpenters •*w* summer, 50 hr week; winter, 48 hr week **Ranges** •*A* 6/57, 90–120; 6/56, 80–110 •*B* 57–65 •*C* 6/57, 130–150; 6/56, 115–140 •*D* 6/57, 130–150; 6/56, 115–150 •*E* 6/57, 120–140; 6/56, 120–130 •*F* 6/57, 28.70–29.50; 6/56, 26.70–27.50 •*G* 6/57, 25.50–26.20; 6/56, 23.70–24.50 •*H* 6/57, 31.80–32.70; 6/56, 29.60–30.50

AFRICA AND MIDDLE EAST

City and Country										
Ankara, Turkey *a*	1.50	1.25	2.00	1.50	2.00	1.50	2.25	1.75	2.25	1.75
Baghdad, Iraq *ab*	500	1,000*A*	400*B*	500*B*	1,500*C*	400*C*	1,500*C*	400*C*	2,000*D*	1,000*D*
Beirut, Lebanon *a*	1.00*E*	0.95*E*	0.85*F*	0.75*F*	2.00*G*	1.25*G*	2.00*H*	1.85*H*	2.00	1.50*I*
Cairo, Egypt *ab*	40	40	30	30	90	100	90*J*	100*J*	70	80*K*
Casablanca, Morocco *ac*	80*L*	80*L*	80*L*	80*L*	177	177	154	154	177	177
Durban, Natal	-/-/9*de*	-/-/8½*de*	-/-/9*de*	-/-/8½*de*	-/4/9*af*	-/3/9*af*	-/4/9*af*	-/3/9*af*	-/4/9*gh*	-/3/9*gh*
Jerusalem, Israel *ab*	12.720	11.350	11.280	9.450	13.340	11.050	13.280	12.000	13.320	12.200
Salisbury, No. Rhodesia *i*	-/-/5½*j*	....	-/-/5½*j*	....	-/10/-*kM*	....	-/10/-*kM*	....	-/10/6*kN*	....
Salisbury, So. Rhodesia *i*	-/1/3*j*	-/1/3*j*	-/1/3*j*	-/1/3*j*	-/11/2*k*	-/11/-*k*	-/10/8*k*	-/10/6*k*	-/8/8*kl*	-/8/6*kl*
Tel Aviv, Israel *a*	8.620	8.230	....	....	10.315	9.550	10.315	9.550	....	....

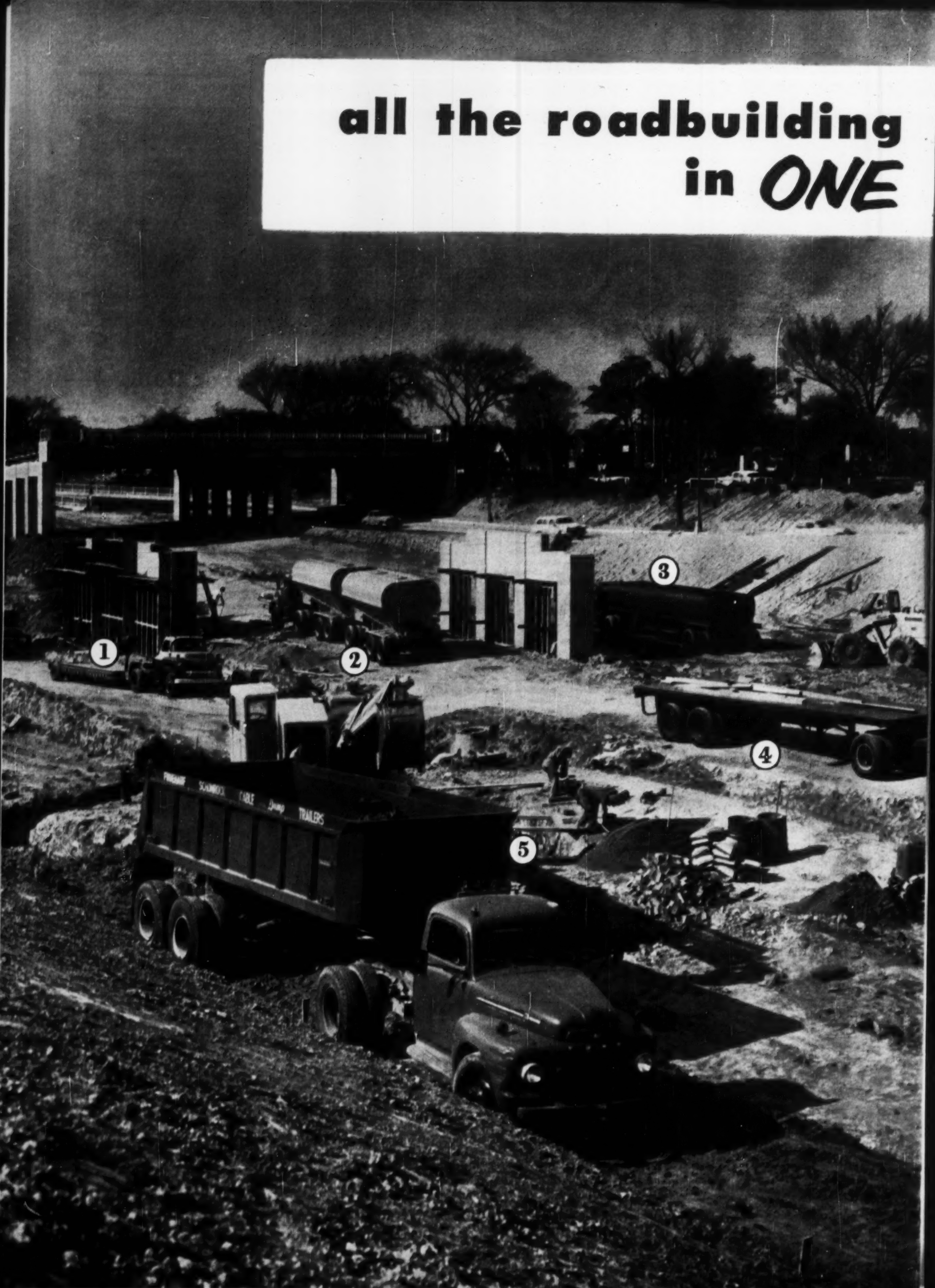
•*a* 8 hr day •*b* rate per day •*c* 10 hr day permitted up to maximum of 50 hr week to allow for time lost because of weather •*d* 8 2/5 hr day •*e* plus cost of living -/16/9, -/2/6 housing, -/2/6 holidays, per week • 6/57, plus cost of living, -/2/10, 6/56, -/3/6; 6/57, -/-/6½ holiday pay per hour, 6/56, -/-/5½ and -/6/8, pension fund •*g* 9¼ hr day •*h* 6/57, plus cost of living -/2/10; 6/56, -/2/7½; 6/57, -/-/6½ holiday pay per hr, 6/56, -/-/3 •*i* 48 hr week in Northern Rhodesia; 42 hours in Southern Rhodesia •*j* African labor •*k* European labor •*l* 45 hr week on heavy construction, 6/57, -/11/2 per hour; 6/56, -/11/- **Ranges:** •*A* 500–1,000 •*B* 6/57, 300–400; 6/56 300–500 •*C* 6/57, 1,250–1,500; 6/56 250–400 •*D* 6/57 1,250–2,000; 6/56, 500–1,000 •*E* 6/57, 0.80–1.00; 6/56, 0.80–0.95 •*F* 6/57, 0.75–0.85; 6/56, 0.65–0.75 •*G* 6/57, 1.50–2.00; 6/56, 1.00–1.25 •*H* 6/57, 1.50–2.00; 6/56, 1.25–1.85 •*I* 6/56, 1.25–1.50 •*J* 6/57, 80–90; 6/56, 90–100 •*K* 6/56, 60–80 •*L* 67–80 •*M* -/8/ to -/10/- •*N* -/9/6 to -/10/6

NORTH AMERICA (including U. S. possessions)

City and Country										
Anchorage, Alaska *a*	3.445	3.285	3.41	3.25	4.61	4.39	3.87	3.69	4.235	4.035
Calgary, Canada *a*	1.55	1.45	1.45	1.35	2.50	2.30	2.25	2.05	2.35	2.25
Honolulu, Hawaii *a*	1.75	1.56	1.55	1.35	2.75	2.50	2.45	2.20	2.65	2.50
Montreal, Canada *ae*	1.40	1.30	1.40	1.30	2.20	2.10	2.00	1.90	2.15	2.00
New York, USA *f*	2.86*a*	2.70*a*	2.86*a*	2.70*a*	4.62*g*	4.15*g*	4.05*g*	3.834*g*	4.399*a*	4.18*a*
Ottawa, Canada *a*	1.25*A*	1.05*A*	1.10*B*	1.15*B*	2.20	2.20	1.92*b*	1.92*b*	2.20	2.20
San Francisco, USA	2.605*a*	2.425*a*	2.605*a*	2.425*a*	4.115*g*	3.875*g*	3.455*a*	3.16*a*	3.50*a*	3.35*a*
Toronto, Canada	1.61*h*	1.51*h*	1.61	1.51	2.81*a*	2.558*a*	2.60*a*	2.20*a*	2.60*a*	2.50*a*
Winnipeg, Canada	1.30*c*	1.20*c*	1.50*c*	1.40*c*	2.35*d*	2.25*d*	2.15*d*	2.05*d*	2.30*d*	2.20*d*

•*a* 8 hr day •*b* plus 4% vacation fund •*c* 48 hr week •*d* 40 hr week •*e* plus 8% fringe benefit •*f* includes fringe benefit •*g* 7 hr day •*h* 8 hr day **Ranges:** •*A* 6/57, 1.10–1.25; 6/56, 1.00–1.05 •*B* 6/57, 1.00–1.10; 6/56, 1.05–1.15

all the roadbuilding in *ONE*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CABLE Dump TRAILERS
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- **Fruehaufs are designed simply, for economy in price and upkeep.**
- **Fruehaufs never become "orphans"—they're backed up by service.**
- **Fruehaufs of most types are ready for delivery *right now.***
- **Fruehaufs earn extra profits for extra years.**

Five different high-capacity, moneymaking Fruehauf Trailers are shown left on the scene of a current roadbuilding project. (1) is a Removable Gooseneck Carryall which permits front end loading and unloading, cuts unloading time of heavy cranes and shovels to less than 15 minutes, and requires no winch in models with capacities up to 50 tons. (2) is an Airslide* Bulk Cement Tank train, a rapidly-discharging unit noted for the simplicity and economy of its high-speed unloading mechanism. (3) is a Hopper-Type Dump, one of a variety of rugged, specially designed units, with capacities up to 14 cubic yards, to haul such materials as sand, crushed stone, bulk cement, and other aggregates. (4) is a heavy duty Platform Trailer for machinery and heavy building materials, ruggedly designed for "plus" payloads. (5) is a Fruehauf-Schonrock Cable Dump, profitable because of its extremely light weight which permits payload bonuses of up to 4,000 pounds.

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. . . World price trends

(Continued from page 149)

sion of the nuclear station at Mol. A $10 million loan from the World Bank at the same time will help finance improvements to the Charleroi-Clabecq Canal, which links the coal and steel industries in southern Belgium to the ports of Brussels and Antwerp.

• **Copenhagen, Denmark**—An easing of fiscal policy, including a more liberal housing subsidy policy, stimulated construction activity in Denmark in early '57. Residential building rose 20%; industrial and commercial building was unchanged, but public construction jumped a sharp 75%. Good weather also favored construction in 1957 compared with last year. But a new economic crisis threatens to curb construction in the last half of the year. A compulsory savings program may rob firms of funds earmarked for construction. Thus materials and unskilled labor are expected to be ample in late 1957. Skilled labor will remain scarce.

• **Dublin, Ireland**—Construction in Ireland drags behind the last year's level, with unemployment of both skilled and unskilled labor high and materials in good supply. Northern Ireland is tackling a similar depressed situation by offering extraordinary inducements to attract foreign capital.

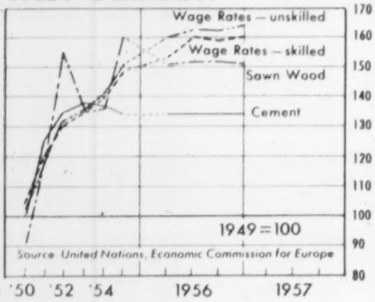
• **Geneva, Switzerland**—Building is booming in Switzerland. This year's construction is estimated at $1.1 billion, 10% greater than 1956. Public construction leads the increase, aided by a 36% expansion in industrial construction. Residential building lags 3% behind last year in the big towns and by 44% in small communities. Warnings to put a brake on public construction to curb inflationary tendencies have been issued by the federal government.

There is no shortage of materials despite the fact that some cement and almost all steel has to be imported. Lumber is imported in part. Moreover, a large part of the labor force is imported from Italy. Labor rates have increased 8% in the year, but material prices have been surprisingly steady.

• **Helsinki, Finland**—Heavy inflationary pressures in Finland forced a 39% devaluation of the Finnish mark in mid-September to 320 marks to the U. S. dollar from the official rate of 231. As a result, living costs are expected to rise 15%. The devaluation followed unsuccessful attempts to curb rising prices by credit restrictions. The impact on construction is likely to be depressing.

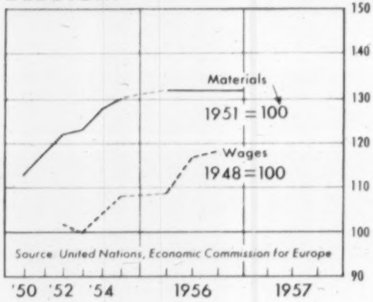
• **Lisbon, Portugal**—More construction is going on in Portugal than ever before. Four hydroelectric dams will be started this year. Three irrigation schemes are under construction.

WEST GERMANY



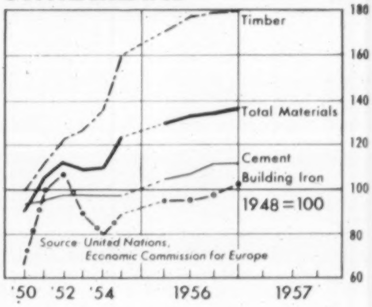
Source United Nations, Economic Commission for Europe

BELGIUM



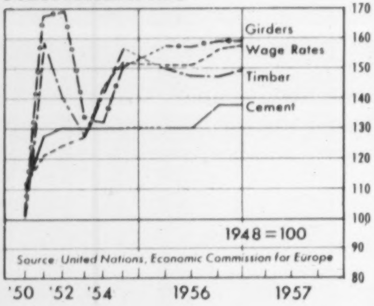
Source United Nations, Economic Commission for Europe

SWITZERLAND



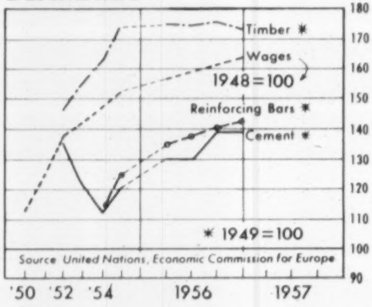
Source United Nations, Economic Commission for Europe

NETHERLANDS



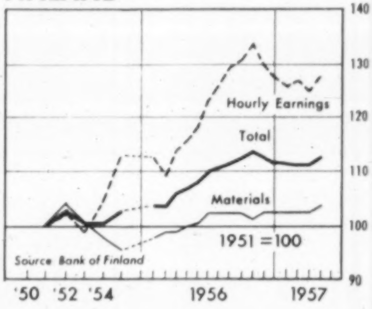
Source United Nations, Economic Commission for Europe

DENMARK



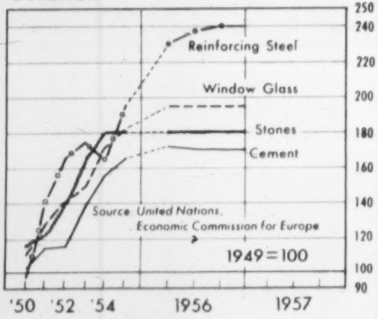
Source United Nations, Economic Commission for Europe

FINLAND



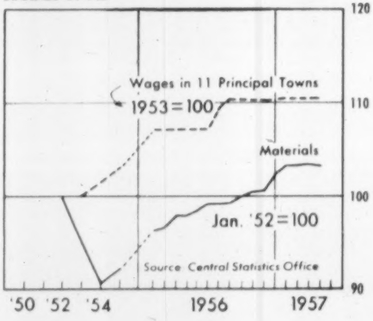
Source Bank of Finland

GREECE



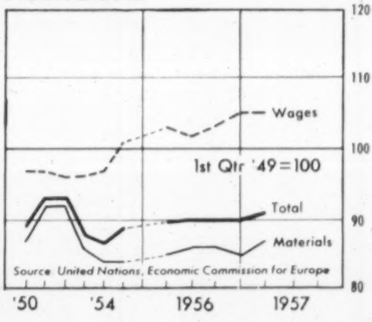
Source United Nations, Economic Commission for Europe

IRELAND



Source Central Statistics Office

PORTUGAL



Source United Nations, Economic Commission for Europe

No American contractors are operating in Portugal at present. Unskilled labor is plentiful and so are all locally available materials. Prices are unchanged from last year.

• **London, England**—Britain's dramatic upping of the central bank's discount rate from 5% to 7% in September rocked not only Britain, but the world. It highlights worldwide efforts to curb inflation, to hold down public and private investments in new facilities, to cut bank loans. In Britain, it is certain to tighten mortgage funds, to check construction, which so far this year was running 6% ahead of 1956. Rising living costs have made labor unwilling to accept the government's plea for wage stability. Rates in June 1957 were running 5.9% above last year for common labor and just under 5% for skilled. Controlled prices of steel were lifted 6% on average in December 1956. Structural steel in June, 1957 at the mill was quoted at 11% above a year earlier.

• **Madrid, Spain**—Spain, too, has been caught in the inflation spiral and turned to austerity programs to curb price increases. In July, the discount rate for commercial transactions was raised for the second time in less than a year from 4¼% to 5%, and the bankers' rediscount rate was lifted from 3.4% to 4%. In addition, the government has imposed import restrictions, restricted bank credit to companies and individuals, and cut government expenditures.

• **Oslo, Norway**—Norway has also felt the pressure of rising prices and has cut import tariffs to increase the supply of goods. Public construction has declined and so has home building. Industrial and commercial construction has kept on a par with 1956, but this is a small sector of the building market. Construction costs continue to rise despite the good supply of materials and unskilled labor. There is a shortage of skilled labor.

• **Paris, France**—France touched off the European financial crisis when in July it devalued the franc for most foreign trade transactions by offering 420 francs to the U. S. dollar against the former 350. France's austerity program to curb the boom also included a lifting in the Bank of France discount rate from 4.5% to 5%, credit restrictions, budget cuts, increased taxes, and import controls.

These restrictions are aimed directly at the country's economic expansion and industrial modernization program, which in the first four months of 1957 ran construction activity almost 17% above the same months of 1956. Labor and material prices are surging upward, with the government threatening to freeze prices rather than yield to higher wage demands.

There is a serious shortage of construction workers, especially skilled labor. Many young workers have been syphoned off to fight in Algiers. Foreign workers are not attracted to France because of the high cost of living.

• **Rome, Italy**—Shifting of the Italian population from the country to the cities is aggravating the already large unemployment situation in Italy and creating huge construction needs. Unemployment applications from construction workers topped 275,000 in the last quarter of '56.

The World Bank took the first step in August, 1957 toward financing construction of a large nuclear power station in southern Italy by sponsoring a study of requirements. Vitro Engineering Co. of New York will design and engineer construction of a $46 million nuclear power plant near Rome. Construction will begin in 1962.

Italian oil interests are also exploring oil in Iran, designed to cut the country's dependence on higher priced sources and ease her balance of payments needs.

American firms like Union Carbide and American Machine and Foundry are expanding operations in Italy. Union Carbide will construct a plant for plastic production.

• **Stockholm, Sweden**—After two years of efforts to curb inflation by credit restriction, Sweden boosted its central bank rate in July from 4% to 5%—the stiffest rate increase in 26 years. It further reinforced its determination to curb rising prices and wages (wages are tied to cost of living increases) by placing a special tax on investment in industrial plant and equipment and new industrial developments. The rate hike came only a few weeks after the government had announced it was stepping up its housing program to 50,000 new dwellings a year.

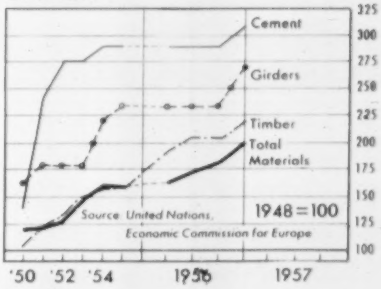
• **Vienna, Austria**—Austria also is curbing inflation by restricting credit and reducing public construction. However, the 1957 construction program will include a $37 million roadbuilding project, $15 million for *Autobahn* construction and $65 million for three housing projects.

Construction material shortages have disappeared; delivery time on structural steel has been cut from two years to six months. Cement and bricks are available for immediate delivery.

Contractors can now be selective in picking common construction labor, while skilled labor can be had currently without paying high cash bonuses.

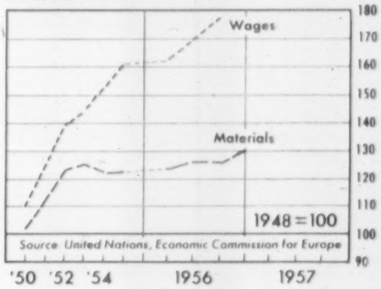
(*Coantinued on page 154*)

SPAIN



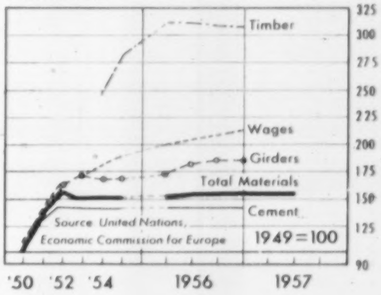
Source United Nations, Economic Commission for Europe

NORWAY



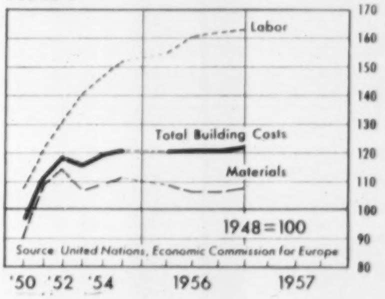
Source United Nations, Economic Commission for Europe

FRANCE



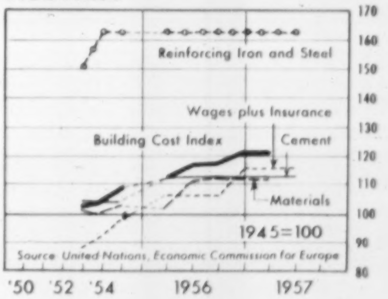
Source United Nations, Economic Commission for Europe

ITALY



Source United Nations, Economic Commission for Europe

AUSTRIA

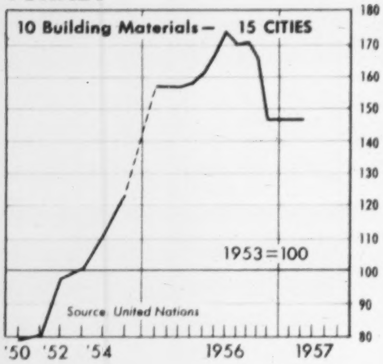


Source United Nations, Economic Commission for Europe

. . . World price trends

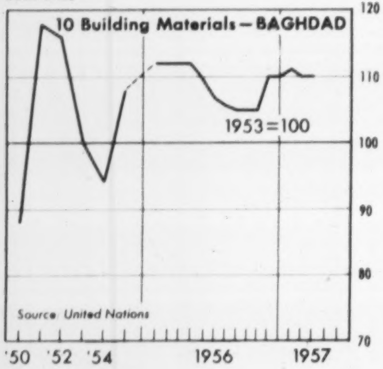
(Continued from page 153)

TURKEY



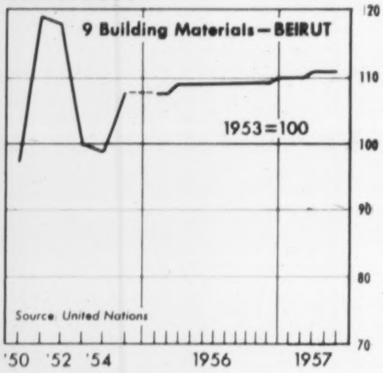
Source United Nations

IRAQ



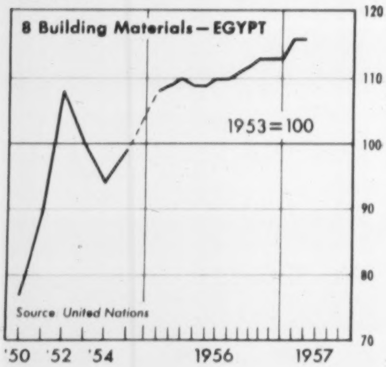
Source United Nations

LEBANON



Source United Nations

EGYPT



Source United Nations

Africa and Middle East

Construction in Africa and the Middle East has been and continues to be hampered by the political situation, war tensions, and falling copper prices (South Africa). However, public projects are in full swing in Turkey, Israel, and Southern Rhodesia. Material supplies are getting more plentiful.

• **Ankara, Turkey**—Turkey can be likened to an immense construction job site. The government's industrialization program forges ahead despite grave shortages of construction materials. This year's construction activity is 30% ahead of last year.

The government sponsored Cement Industries Corp. of Turkey already has set up eight new cement plants with a total capacity of 1.5 million tons annually and three more plants with an annual capacity of 320,000 tons are to be completed by the end of 1957.

Turkey has contracted with the German Krupp Group to double the capacity of its Karabuk Iron and Steel Works, the country's major steel producer.

There is no shortage of unskilled construction labor, but skilled workers are being diverted to the rapidly expanding industrial plants.

• **Baghdad, Iraq**—Most construction activity in Iraq is for the government and is on the same level as last year despite the effects of the Suez blockade.

Labor is plentiful, but efficiency is so low that both skilled and unskilled workers require heavy supervision. Supervisory costs are estimated to run as high as 150% of the straight labor cost.

• **Beirut, Lebanon**—The Suez crisis put a crimp in Lebanese construction, which lags behind 1956. Material supplies are generally adequate. Steel bar supplies vary. Only French steel sections are available. Gravel is in short supply, with crushers unable to keep up with the demand. The volume and quality of skilled and unskilled labor is adequate.

• **Cairo, Egypt**—Construction in Egypt also bears the scars of the Suez incident. Activity is below last year and is largely for the government. No building permits have been issued for office buildings, apartments, and homes since July last year. Industrial construction, though not subject to the permit ban, lags because of the general economic situation. Even such welfare projects as low cost housing, village social centers, and schools are at a minimum.

Both skilled and unskilled labor is plentiful, but quality is low, materials are now adequate in supply.

• **Casablanca, Morocco**—For the third consecutive year construction has been declining in Morocco as war in neighboring Algeria puts capital to flight. This year, construction is down 20% to 25%. About 80% of current construction is public. Skilled European labor is leaving the country and what remains is more than enough for current requirements. Labor costs are unchanged, but material costs are shooting upward.

• **Jerusalem and Tel Aviv, Israel**—With 100,000 new immigrants expected this year as a result of political developments in Africa and elsewhere, government construction of housing has been stepped up to accommodate the influx. Plans are reported for constructing 30,000 housing units this year at a cost of $97 million and to continue building 20,000 new units a year for the next five years.

In addition to housing, Israel is proceeding with the construction of tunnels, conduits, and dams as part of the national water development program. A £25 million (Israel:) ($13.9 million) Tel Aviv sewerage project is making progress. Construction is also being stepped up in the Eliath (Gulf of Aquaba) area.

• **Durban, Natal** (South Africa)—Construction in the Durban area in the first half of 1957 was ahead of last year, but the last half is expected to trail off, leaving the year below the 1956 level.

The Union of South Africa registered a $10 million bond issue with the Securities and Exchange Commission in September, 1957 and just obtained a $25 million loan from the World Bank to carry out its transportation development program, which includes railroads and other facilities.

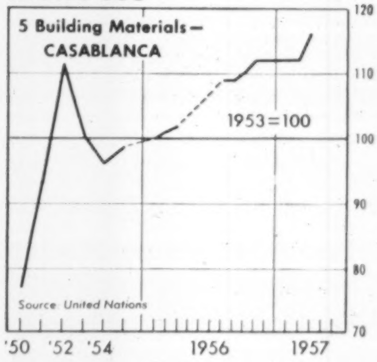
• **Northern Rhodesia**—The worldwide drop in copper prices has curtailed construction activity of copper companies. Nevertheless, Mufulira Copper Mines, Ltd., a major producer in the area, announced a $39.2 million expansion program in July, 1957 to expand output over the next five years.

Labor is plentiful and becoming more so as skilled men leave the copper mines and seek jobs in construction. Quality of skilled white labor is high, but Negro labor is not very dependable and turnover is high.

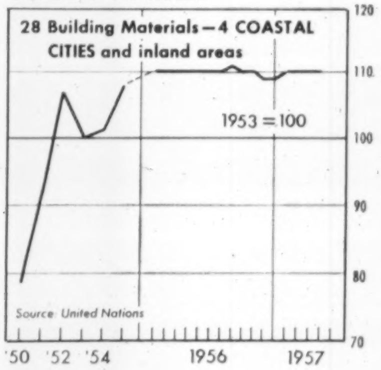
• **Southern Rhodesia**—Construction of the 370 ft. hydroelectric dam spanning the Kariba Gorge is in full swing. The $224 million project will produce 1.2 million kw of electricity for the copper mines of Northern Rhodesia and the cities of Southern Rhodesia.

(Continued on page 157)

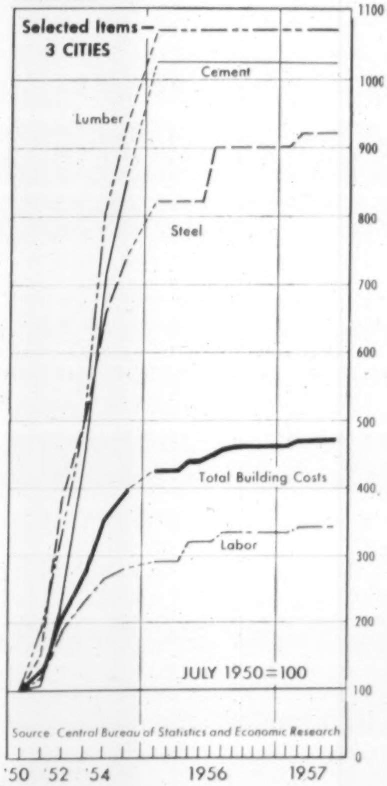
MOROCCO



SOUTH AFRICA



ISRAEL



Ramset speeds erection of two-story "piggy-back"

Thanks to curtain-wall construction and RAMSET® fastening, there was no need to reinforce the understructure of this new Denver office building. Using RAMSET, two new floors went up in three weeks *without disturbing the tenants in the lower eight floors!*

The speed, quietness and portability of RAMSET helped to make this "piggy-back" operation a success.

RAMSET operators are able to move fast because they have no power lines or bulky equipment to slow them down. One-hand operation makes for faster, safer work. Fasteners and charges are conveniently carried in a pocket. There is no time wasted drilling. Holding power exceeds old-style fastening methods.

Call your RAMSET dealer (listed under "Tools" in your phone book). He's an expert on fastening to steel and concrete.

T. J. Moore, architect; K. C. Construction Supply Co., curtain wall contractor; Neal Electric Co., electrical contractor; Bell Plumbing & Heating Co., plumbing contractor.

Ramset Fastening System
WINCHESTER-WESTERN DIVISION
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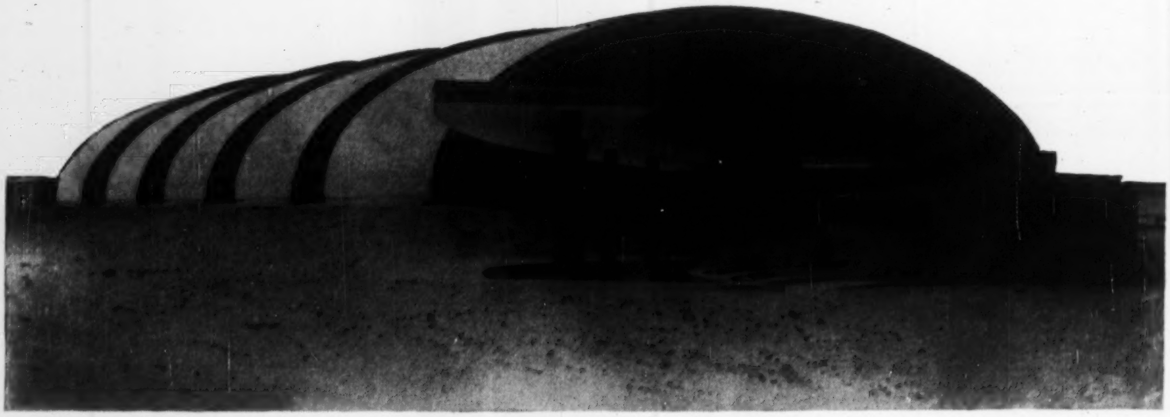

Gymnasium in Willcox, Arizona; designed by Scholer, Sakellar & Fuller, Tuscon, Arizona.

. . . because welded design is more easily adapted to dramatic new architectural concepts which combine functional beauty and economy of construction.

For example: this gymnasium which has no interior support to obstruct view or activity is made practical by the simplicity of welded design. Welded steel arch beams with tapered webs place the steel where it is needed and eliminate excess weight. Steel building panels which form the shell of the building are welded to the arch beams. This eliminates costly, time-consuming drilling and fastening.

This is just one of many examples of how modern architects are turning to welded design to make their creative ideas structurally and economically possible.

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. . . World price trends

(Continued from page 154)

North America

Rising interest rates and tight money have curbed homebuilding in Canada as in the U.S. The Central Bank of Canada raised prime rates to 5¾% in August, just under the statutory limit of 6%. In September, however, a decline in the bank's discount rate raised hopes that credit may be getting easier.

- **Anchorage, Alaska**—Construction activity in Alaska is below the 1956 level, especially in the cities. Big volume of construction is in the "bush," on military jobs way out on the tundra.

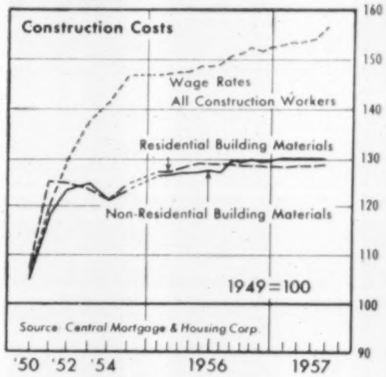
Material supplies are good. Unskilled labor is plentiful. There is an adequate supply of skilled labor, though ironworkers, sheet metal workers and operating engineers are sometimes hard to get.

- **Calgary, Canada**—After a series of big construction years reaching a record in 1956, activity in Calgary dropped sharply in the first four months of 1957.

There is a surplus of carpenters and bricklayers in the area, but electricians, plumbers, and structural steel workers are in short supply. Materials are in good supply except for wide-flange steel beams and heavy plates.

- **Honolulu, Hawaii**—Last year was Hawaii's biggest postwar construction year and 1957 may be even bigger if the $21 million Capehart housing project for Schofield Barracks gets going.

CANADA



Common labor is plentiful; skilled labor, short. In fact, the labor market is tighter than a year ago, but materials appear a bit easier.

- **Ottawa, Canada**—Construction activity in the Ottawa area is running below the 1956 level largely because of the slump in homebuilding. Rising interest rates plus a shortage of mortgage funds have choked off residential construction. But non-residential construction is active, about on the par with last year.

- **Winnipeg, Canada**—Homebuilding in the Winnipeg area is also feeling the pinch of tight money.

Other types of construction have not been affected, though no new large-scale projects have been started.

These developments plus a new cement plant have wiped out any cement shortage in Manitoba. Lumber and reinforcing steel are also in good supply. Only structural steel remains a problem, though heavy steel ordered well in advance from the U.S. is arriving on time. There is no shortage of unskilled labor and there is a surplus of carpenters and bricklayers. Mechanics and electricians are hard to get.

Canada Construction Cost Indexes—1949=100

Central Mortgage Housing Corp.

NON-RESIDENTIAL				RESIDENTIAL			
'39	57.9	'49	100.0	'39	48.1	'49	100.0
'40	60.0	'50	105.1	'40	51.2	'50	106.0
'41	63.9	'51	118.8	'41	56.0	'51	123.1
'42	67.2	'52	125.4	'42	60.0	'52	126.6
'43	69.5	'53	128.9	'43	63.7	'53	128.9
'44	70.5	'54	128.6	'44	66.4	'54	129.0
'45	71.1	'55	131.5*	'45	67.2	'55	132.7*
'46	75.0	'56Aug	136.8*	'46	70.4	'56Aug	137.1*
'47	84.3	'56	136.5	'47	80.9	'56	137.5
'48	95.3	'57Aug	140.8	'48	95.0	'57Aug	140.4

Weighted indexes of wholesale prices and wage rates. Intangibles, productivity, etc., not included. * Revised

Canadian Wage and Cost of Living Changes—1949–'56

Canadian Construction Association

Unweighted average wage rate increases for 8 principal construction occupations (including vacation pay allowances)

	PERCENT INCREASE							
	in wage rates				in cost of living			
City	'49-'57*	'54-'55	'55-'56	'56-'57	'49-'57*	'54-'55	'55-'56a	'56-'57
Halifax	50.6	7.0	0.0	9.2	19.1	0.8	1.1	2.7
Saint John	46.0	3.6	3.0	2.6	22.0	0.9	1.2	2.8
Montreal	55.1	1.6	3.8	4.5	21.5	−0.4	2.1	2.0
Ottawa	54.6	4.0	4.7	4.1	23.2	0.5	2.0	3.2
Toronto	53.1	2.6	5.1	4.1	25.2	−0.1	2.4	3.0
Winnipeg	63.6	7.9	4.0	6.5	19.6	0.0	1.8	1.7
Regina	55.2	1.2	2.3	4.9	18.8*b*	0.2	1.1*b*	2.8*b*
Saskatoon	51.3	2.5	4.0	3.4	18.8*b*	0.2	1.1*b*	2.8*b*
Calgary	52.6	2.2	3.0	7.1	18.4*c*	−0.6	1.4*c*	2.3*c*
Edmonton	44.4	1.4	3.8	2.3	18.4*c*	−0.6	1.4*c*	2.3*c*
Vancouver	52.9	1.2	0.8	9.0	21.5	−0.4	2.4	1.8
Average, 11 cities	52.7	3.2	3.1	5.2	20.6	0.0	1.6	2.5

* July 1 to July 1 except cost of living for 1957, which is June 1, 1957 •a revised •*b* Saskatoon-Regina index •*c* Edmonton-Calgary index

Canadian Building Trades Wage Rates July 1, 1957

Dominion Department of Labour and Canadian Construction Association

	BRICKLAYERS				CARPENTERS				ELECTRICIANS				PAINTERS			
City	1939J	1945J	1956	1957	1939J	1945J	1956	1957	1939J	1945J	1956	1957	1939J	1945J	1956	1957
Halifax	a $1.00	$1.15	$1.94	$2.09	$0.70	$0.95	$1.69	$1.84	$0.85	$1.06	$1.79	$1.94	$0.60	$0.81	$1.45	$1.60
Saint John	0.90	1.10	1.85	1.92	0.50–0.60	0.81	1.58	1.58*b*	0.50–0.65	0.85	1.63	1.70	0.50–0.55	0.76	1.47	1.51
Quebec	0.75–0.85	1.00	1.80	1.90	0.55–0.60	0.80	1.60	1.70	0.55–0.65	0.80	1.70	1.80	0.50–0.55	0.75	1.50	1.60
Montreal	0.80–0.90	1.06	2.10	2.20	0.70	0.96	1.90	2.00	0.75	1.01	2.00	2.00*c*	0.66	0.86	1.80	1.90
Toronto	1.00	1.23	2.61	2.71	0.90	1.11	2.40	2.50	1.00	1.21	2.65	2.80	0.75	0.97	2.05	2.05*b*
Hamilton	0.90	1.19	2.40	2.50	0.75	1.04	2.20	2.20*c*	0.75	1.05	2.40	2.40*c*	0.65	0.86	1.75	1.75*c*
Windsor	1.15	1.26	2.45	2.55	0.95	1.18	2.22	2.22*c*	1.15	1.26	2.35	2.35*c*	0.60–0.65	0.95	1.90	1.93
Winnipeg	1.10	1.25	2.25	2.35	0.85	1.05	2.05	2.15	0.85	1.05	2.20	2.35	0.70	0.90	1.70–1.80	1.90
Saskatoon	1.00	1.20	2.29	2.35	0.50–0.75	0.96	1.95	2.00	0.70–0.80	0.93	2.05	2.05	0.50–0.70	0.70	1.75	1.80
Edmonton	1.10	1.31	2.40	2.40	0.90	1.03	2.00	2.00	0.85	1.06	2.35	2.50	0.80	0.91	1.80	1.80
Vancouver	1.10	1.29	2.40	2.60	0.75–0.90	1.12	2.25	2.44	0.75–1.00	1.19	2.42	2.81	0.63–0.80	0.97	2.19	2.35

	PLASTERERS				PLUMBERS				SHEETMETAL WORKERS				LABORERS			
City	1939J	1945J	1956	1957	1939J	1945J	1956	1957	1939J	1945J	1956	1957	1939J	1945J	1956	1957
Halifax	a $0.80	$0.95	$1.83	$1.98	$0.85	$1.025	$1.78	$1.93	$0.70	$0.85	$1.55	$1.70	0.30–0.40	$0.52	$1.18	$1.33
Saint John	0.90	1.10	1.85	1.92	0.60–0.70	0.88	1.70	1.80	0.50–0.65	0.81	1.50	1.50	0.30–0.40	0.53	0.80	0.80
Quebec	0.75	1.00	1.80	1.90	0.55–0.65	0.80	1.70	1.80	0.55–0.65	0.80	1.60	1.70	0.40	0.60	1.20	1.30
Montreal	0.80	1.06	2.12	2.17	0.75	1.01	2.12	2.22	0.65–0.75	0.96	1.90	2.00	0.40	0.61	1.30	1.40
Toronto	0.90	1.21	2.45	2.60	1.00	1.17	2.44	2.44*b*	0.93	1.18	2.40	2.55	0.35–0.50	0.67	1.45	1.55
Hamilton	0.90	1.07	2.35	2.45	0.85	1.07	2.35	2.45	0.75	1.04	2.35	2.45	0.35–0.45	0.65	1.25	1.40
Windsor	0.90	1.15	2.20	2.40	1.00	1.25	2.35	2.55	0.70–0.85	1.06	2.25	2.35	0.55	0.75	1.66	1.66
Winnipeg	1.10	1.25	2.25	2.35	0.95	1.15	2.25	2.40	0.70	0.85	1.95	2.10	0.40–0.45	0.63	1.20	1.30
Saskatoon	0.75–1.00	1.06	2.20	2.30	1.00	1.06	2.15	2.25	0.75–0.90	0.81–0.85	1.85	1.96	0.30–0.40	0.58	1.38	1.43
Edmonton	1.05	1.31	2.30	2.35	1.05	1.16	2.35	2.35	0.90	1.07	2.25	2.25*b*	0.40–0.50	0.61	1.35	1.48
Vancouver	1.00	1.10	2.35	2.50	1.00	1.19	2.35	2.70	1.00	1.18	2.35	2.35*c*	0.45–0.50	0.71	1.66	1.66*c*

Hourly allowance in lieu of vacation pay are not included. Allowances for above trades are: Halifax, 3¢ for all skills except 4¢ for carpenters & electricians and none for labourers; St. John, 2%; Quebec, 2%; Montreal, 2%; Toronto, 4%; Hamilton, 4% except 2% for painters; Windsor, 4%; Winnipeg, 4% except 2% for electricians; Saskatoon, 4%; Edmonton, 4%; Vancouver, 2% except 4% for carpenters, plumbers & sheet metal workers •J Rates as of June 1
•a 1939 & 1945 rates include allowance in lieu of vacation pay •*b* in conciliation •*c* negotiating

Jurisdiction May Wane as Cost Bugaboo

How will construction costs in the future be affected by jurisdictional disputes between the building trades?

Present indications are that stoppages related to disputes over work assignments, which last year delayed an estimated half billion dollars worth of construction in New Jersey alone, will decrease, and that a greater measure of jurisdictional stability will be achieved. Net result would be some relief from upward pressures on construction costs.

Within recent months, the biggest promise of further stabilization has come from the joint efforts of labor and management to improve and strengthen what the construction industry calls its voluntary machinery for "frontline resolution" of jurisdictional conflicts—the National Joint Board for the Settlement of Jurisdictional Disputes. Coupled with this activity, which reflects a growing interest in avoiding further government interference, is a Joint Board request, now before the National Labor Relations Board, that the NLRB strengthen the Joint Board by using its power to prevent jurisdictional strikes without disturbing the present concept of the Joint Board as the established agency for settling jurisdictional disputes in the construction industry.

• **Nature of disputes**—Largely because of human nature, however, even the Joint Board feels it's "no doubt impossible to eliminate jurisdictional disputes", just as friction of one sort or another is almost inevitable even in the best of family units. And as the volume of construction rises, and as new materials and methods are introduced, areas of possible jurisdictional friction increase—as does the burden on contractors, who have the initial responsibility of making work assignments from which the disputes arise.

Basic question is this: To which craft—carpenter, plumber, etc.—does a specific job belong? Should composition shingle roofs, for example, be put on by carpenters or roofers, should forms be dismantled by laborers or carpenters? Ultimate question is whether the contractor's work assignment is correct.

Among typical disputes that arose this year was one between carpenters and sheet metal workers over installation of 24 gauge asbestos coated sheet metal siding (nailed to wood) at the new Shippingport, Pa., atomic installation. Dravo Corporation assigned the work to sheet metal workers and the carpenters protested in a three-day walkout. In another, the carpenters successfully protested erection of steel scaffolding by steamfitters at a sewage treatment plant in Pittsburgh, Pa. A dispute between iron workers and pile drivers over the right to put in steel piling tied up work on the $46 million Carquinez Bridge in the San Francisco Bay area for 18 days. And during construction of the $7.5 million Love Field air terminal in Texas, elevator contractors protested assignment of moving sidewalk work to iron workers and millwrights.

Numerically, these are merely a drop in the bucket. Last year, some 2,000 jurisdictional disputes came to the attention of the Joint Board; work stoppages occurred in more than 800 and, of these, 41 were initiated by contractors who shut down work. The Joint Board issued 354 job decisions and took other actions in 334 cases.

Thus the nature and the genesis and the impact of disputes have pointed up the community of interest contractors and unions and the public have in their orderly settlement. In discussing the union-contractor interest, John Dunlop, who retired this summer as impartial chairman of the board, recently stated:

"The system of competitive bidding by contractors requires an orderly system of settling jurisdiction; the bids which a contractor submits will vary depending on which craft is used to perform work since wage rates, working rules and productivities (labor costs) vary among crafts. Contractors have thus a vital interest in having jurisdiction determined in advance and in having jurisdiction applied uniformly among competitive contractors submitting bids. On the union side, the jurisdictional system seeks to regulate competition among unions in the industry. Jurisdiction is the very core of stability in industrial relations in the industry".

To achieve that stability, the industry is engaged in a two-pronged effort to eliminate jurisdictional work stoppages, and to reduce, if not wipe out, the sources of disputes.

• **Joint Board**—For nearly 10 years, that effort has been exerted primarily through the Joint Board, which was established by labor (the AFL building trades) and management for the purposes of self-regulation after Congress, in the Taft-Hartley Act, had given its blessing to voluntary efforts to settle jurisdictional problems within the industry.

Consisting of eight regular and eight alternate members (equally representing the basic and the specialty crafts, and the general and the specialty contractors), the board draws upon the industry's accumulated experience and know-how for the settlement of jurisdictional disputes, and is attempting to build up a consistent body of precedents as work assignment guides to both contractors and unions.

Like any successful agency, the board is bound by and follows definite and predetermined policies and standards. These are contained in the Plan for Settling Jurisdictional Disputes, which is the basic labor-management agreement under which the board was established; the Green Book, which contains that agreement, along with recognized jurisdictional agreements and decisions that have accumulated through the years; and the board's Procedural Rules and Regulations. These set forth the "rules of the road" not only for the board, but also for participating contractors and unions. (A sizable number of national agreements recognized by the board, however, are not yet in the Green Book.)

Eight national contractor associations are participating in the plan, and all the 19 building trades unions affiliated with the AFL-CIO Building and Construction Trades Department are within its orbit.

Heading up the Joint Board is its impartial chairman, Richard J. Mitchell, who has been in the construction business for 35 years. Now executive vice president of The Trimble Company, Pittsburgh, Pa., general contractor, Mr. Mitchell has served for a number of years on the labor committees of the Master Builders Association of Western Pennsylvania, the Mason Contractors Association of Allegheny County,

BOARD CHAIRMAN, R. J. Mitchell, Pittsburgh contractor, will serve on a full-time basis to improve board operations.

Pa. and the Associated General Contractors of America, Inc.

Located across Lafayette Square from the White House, the Joint Board is on the sixth floor of the new AFL-CIO headquarters building, 815 16th Street, N.W., Washington 6, D. C.

• Its operation—Most urgent and difficult task of the board is to keep construction projects rolling despite the occurrence of jurisdictional disputes.

Implicit in the board's operation is what Mr. Dunlop has referred to as rejection of the notions that "unions have the sole right to determine jurisdiction and that work assignments are exclusively the prerogative of management". As a result, contractors are required by contractual agreement to make work assignments consistent with agreements and decisions of record (the Green Book) or, where none, according to existing trade or area practice. Unions have the parallel obligation of refraining from strikes or stoppages or refusal to supply men in protest against or to obtain a work assignment.

Since adherence to these commitments is often the exception rather than the rule, a lot of the board's day-to-day operation consists of handling reported violations of procedural rules—requesting unions to return men to work, telling contractors what specific agreement, if any, controls a disputed assignment, etc., all of which seeks to forestall or halt work stoppages.

Disputed assignments not clearly governed by previous agreements or decisions go, on request, to the Joint Board for job decisions, if efforts to settle on the local level, either through the international unions involved or through recognized local machinery, have failed. Decisions are rendered in favor of crafts, not unions, and are based on trade or area practice. Although they apply only to the projects on which the disputes arose, an effort is made to decide identical cases in the same way to give the industry reliable guides for future protests and assignments. At board meetings, which now average nearly one a week, 15 to 20 cases are handled and at the present time none are more than two weeks old.

Voluntary aspect of the plan, which is both a strength and a weakness, carries over into the enforcement field in which the board has no legal powers of its own. It relies largely on the good faith of the participants to make its rules and decisions stick. (There's considerable doubt that board decisions can be enforced in state or federal courts, leaving the NLRB's injunctive and unfair labor practice procedure as the only means of enforcement—and even this is now in question.)

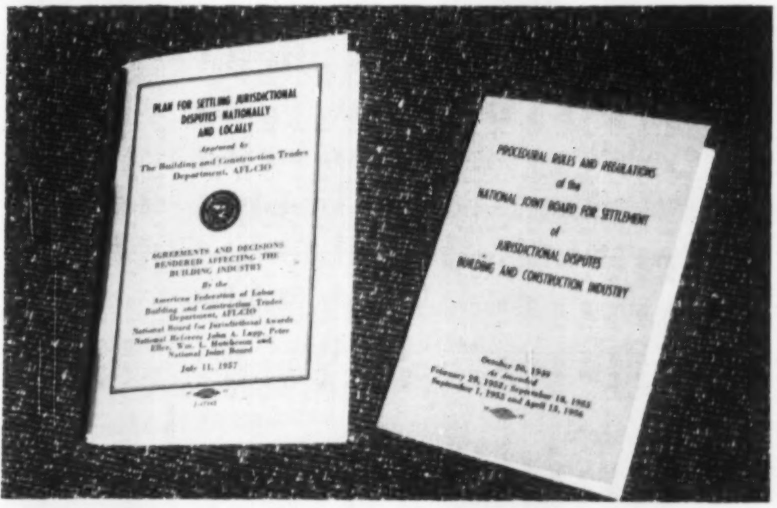
As inducements to compliance, however, the board can refuse to render decisions in favor of wayward unions and can cite contractors to their national associations for noncompliance. At the same time, international unions are supposed to observe a union policy of disciplining local unions and councils that engage in or support jurisdictional picketing.

• Prospects—In a field so complex and full of jealousies and so dependent on the interpretation of words that destroy a hope for every victory gained, it's not surprising that the board has had some rough sledding. Contractors and unions have withdrawn from time to time, and internal criticism has not been rare nor has impatience with the board's compliance failures gone unexpressed. But now all the building trades—although the lathers still protest—are back in the fold and, despite the doubts of some, the industry is generally convinced that it is on the right track.

Mr. Mitchell says compliance with board procedure has improved notably in the last six months. And a number of forward and significant developments have offered the promise of further reducing jurisdictional work stoppages that invariably disrupt construction schedules and costs. Among them are these:

- Eight national agreements, permanently disposing of a number of disputable issues, have been concluded this year between international unions, bringing the total to nearly 35 since the board was established. (The board has consistently encouraged this type of settlement as the most satisfactory form of solution.)
- Mr. Mitchell will become full-time chairman on Jan. 1 in an effort to improve board operations.
- Board procedure for making national decisions has been improved and the board has been given the power to render area decisions on repetitive issues.
- On Aug. 5, the AFL-CIO Building and Construction Trades Department adopted a new constitution making the Joint Board procedure "final and binding" on all its affiliates, and directing all local unions in affiliated councils to put in their labor contracts a clause requiring settlement of jurisdictional disputes under Joint Board procedure.
- According to the Joint Board, prime contractors who are board participants are inserting a similar clause with increasing frequency in subcontracts to assure wider adherence to the Joint Board plan.
- On Sept. 19, the Joint Board formally asked the NLRB to recognize the board as the exclusive agency for settling jurisdictional disputes among those who have submitted to the board procedure, and to use its enforcement machinery to perfect its operations. A decision, which will be a ruling on a carpenter-lather dispute over acoustical ceiling work in Cleveland, Ohio, is expected this month. Regardless of the disposition of the board's request, it is doubtful that the NLRB will abdicate its statutory responsibility of halting strikes engaged in for jurisdictional purposes.

With 10 years of experience behind it, the Joint Board is convinced that jurisdictional disputes no longer present the elusive and insoluble problems of the past, and that confidence in the board and adherence to its procedure will increase as understanding of its concepts, its aims and its operations becomes more widespread.



PLAN FOR SETTLING JURISDICTIONAL
DISPUTES NATIONALLY
AND LOCALLY
Approved by
The Building and Construction Trades
Department, AFL-CIO

AGREEMENTS AND DECISIONS
RENDERED AFFECTING THE
BUILDING INDUSTRY
By the
American Federation of Labor
Building and Construction Trades
Department, AFL-CIO
National Board for Jurisdictional Awards
National Referees John A. Lapp, Peter
Eller, Wm. L. Hutcheson and
National Joint Board
July 11, 1957

PROCEDURAL RULES AND REGULATIONS
of the
NATIONAL JOINT BOARD FOR SETTLEMENT
of
JURISDICTIONAL DISPUTES
BUILDING AND CONSTRUCTION INDUSTRY

October 20, 1949
As Amended
February 20, 1952; September 18, 1953
September 1, 1955 and April 18, 1956

GREEN BOOK (left) and Procedural Rules are the basic tools of the National Joint Board and contain the jurisdictional "rules of the road" for both contractors and unions.

Building Trades Wage Rates — September 1, 1957

Quoted in $/hr., 8-hr. day; time and one-half for overtime after 40 hr. except as noted. Fringe benefits are shown under base rates

		Carpenter	Bricklayer	Ironworker Struc	Ironworker Reinf	Labor Bldg	Labor Hvy	Stone mason	Plasterer	Mosaic & Terr	Tile Layer	Cement Finisher	Lather	Electrn Inside	Painter	Glazier	Plumber	Steam-Fitt'r	Roofer	Waterproofer	Sheet Metal Wkr	Welder	Hoist Eng 1-Dr	Tract Oper 30hp+	Shovel Oper	Truck Dr 1½T+	Air Hvy	Compr Bldg	Air Tool
NEW ENGLAND																													
Mass, Boston	b	3.25 .10^{1}	3.65 .15^{1}	3.70 .20^{2}	3.70 .20^{2}	2.45 .07^{1}	2.35 .07^{1}	3.65 .15^{1}	3.65 .20^{2}	3.65 .15^{1}	3.65 .15^{1}	3.74 .10^{1}	3.65 .20^{2}	3.30** .13^{4}	2.90 .10^{1}	2.95 .06^{1}	3.40 .27^{5}	3.25 .25^{6}	3.25 .15^{7}	3.25 .15^{7}	3.30 .11^{1}	*	3.65 .10^{1}	3.275 .10^{1}	3.65 .10^{1}	2.395	3.20 .10^{1}	3.20 .10^{1}	2.60 .07^{1}
N H, Concord	qq	2.80	3.50	3.65 .10^{1}	....	2.30^{a}	1.70	3.50	3.50	3.50	3.50	3.50	....	2.90^{a}	2.10	2.10	....	....	....	....	....	....	2.725 .10^{1}	2.80 .10^{1}	3.25 .10^{1}	....	2.25 .10^{1}	....	....
MIDDLE ATLANTIC																													
Md, Baltimore	c	3.05 .075^{1}	3.90^{a} .10^{1}	3.65 .075^{1}	3.65 .075^{1}	1.90 .075^{1}	1.90 .075^{1}	3.80^{a} .10^{1}	3.35 .075^{1}	3.195 .075^{1}	3.195 .075^{1}	3.05 .075^{1}	3.35 .075^{1}	3.425 .075^{1}	2.825 .075^{1}	2.725 .05^{1}	3.30 .075^{1}	3.30 .075^{1}	3.00	3.00	3.30 .08^{1}	*	2.85 .10^{1}	3.15 .10^{1}	3.55 .10^{1}	1.90 .075^{8}	2.85 .10^{1}	2.85 .10^{1}	2.00 .075^{1}
N J, Newark	a	3.90‡ .273^{9}	4.15‡ .166^{10}	4.40 .264^{11}	....	....	....	....	4.15‡ .166^{10}	....	....	4.15‡ .166^{10}	3.80‡ .30^{10}	4.125 .289^{12}	3.55‡ .26^{13}	....	3.75 .263^{11}	3.75 .263^{14}	3.75‡ .125^{10}	....	3.70‡ .296^{15}	....	....	....	....	....	....	....	....
N J, Trenton	a	3.60	3.85 .125^{10}	4.30 .18^{16}	....	2.60 .10^{10}	2.60 .10^{10}	....	3.85 .125^{10}	....	....	3.85 .125^{10}	3.50	4.00 .14^{17}	3.20	....	3.75 .30^{18}	3.75 .30^{18}	3.65 .30^{18}	....	3.85 .20^{18}	....	....	....	....	....	....	....	....
N Y, Buffalo	d	3.585	3.69 .08^{20}	3.515 .075^{10}	3.515 .075^{10}	2.61 .075^{10}	2.61 .075^{10}	....	3.715	3.37 .08^{20}	3.37 .08^{20}	3.41	3.71	3.66 .036^{21}	3.20	2.95	3.425 .20^{19}	3.475 .10^{21}	3.23	3.23	3.575	3.515 .075^{10}	3.32 .10^{10}	3.485 .10^{10}	3.485 .10^{10}	2.55 .075^{10}	3.11 .10^{10}	....	2.71 .075^{10}
N Y, New York	e	3.90‡ .31^{22}	4.25 .37^{23}	4.30 .36^{11a}		2.80 .22^{24}	2.80 .22^{24}		4.15‡ .50^{25}	3.90 .31^{26}	3.725 .30^{27}	4.00‡ .32^{28}	4.00‡ .32^{28}	3.65 .40^{29}	3.29‡ .30^{27}	3.95‡ .42^{30}	4.00‡ .58^{31}	4.10‡ .41^{31}	3.75‡ .60^{32}	3.75‡ .60^{32}	3.90‡ .52^{33}		4.15 .33^{28}	3.525 .28^{28}	4.40 .35^{28}	2.21 .225^{34}	3.65 .29^{28}	3.65 .29^{28}	3.25 .16^{10}
Pa, Harrisburg	f	2.98 .035^{1}	3.50	3.95 .18^{1}	3.70 .18^{1}	2.00 .035^{1}	2.00 .035^{1}	3.50	3.125 .035^{1}	3.50	3.00	3.10 .035^{1}	3.125 .06^{1}	3.06	2.50	2.52 .06^{1}	3.25	3.25	2.75 .035^{1}	2.45 .035^{1}	3.00 .20^{1}	*	3.585 .10^{1}	3.20 .10^{1}	3.855 .10^{1}	2.125 .035^{1}	2.15 .035^{1}	2.15 .035^{1}	2.15 .035^{1}
Pa, Philadelphia	a	3.535	3.75 .17^{10}	4.05 .18^{16}	....	2.25	2.55	3.75	3.90 .15^{10}	3.675	3.50 .125^{10}	3.525	3.65 .125^{10}	4.075 .14^{35}	3.025 .125^{10}	3.15	4.00 .19^{37}	4.00 .115^{10}	3.30 .10^{21}	3.30 .225^{38}	3.585 .20^{19}	....	3.695 .10^{10}	3.205 .10^{10}	3.205 .10^{10}	2.35 .125^{40}	3.20 .10^{10}	3.20 .10^{10}	2.25 .10^{10}
Pa, Pittsburgh	g	3.525 .075^{10}	3.95 .175^{41}	3.80 .10^{1}	3.575 .10^{1}	2.325 .175^{41}	2.20 .15^{7}	3.95 .175^{42}	3.575 .175^{41}	....	3.35 .075^{1}	3.45 .175^{41}	3.575 .175^{41}	4.00 .28^{1}	3.25 .10^{1}	3.35	3.775 .175^{41}	3.775 .175^{41}	3.35 .075^{1}	3.35 .075^{1}	3.725 .075^{10}	2.73 .15^{7}	2.96 .10^{1}	3.23 .10^{1}	3.42 .10^{1}	2.27 .15^{7}	2.96 .10^{1}	3.525 .075^{1}	2.25 .15^{7}
SOUTH																													
Ala, Birmingham	h	2.70	3.50	3.20 .10^{1}	3.20 .10^{1}	1.50	1.60	3.50	3.05	3.25	3.25	2.91	2.83	3.30	2.90	2.75	3.32 .10^{1}	3.32 .10^{1}	2.45	2.45	2.95 .075^{1}	*	2.65	2.93	2.93	1.92	2.93	2.52	1.60
Fla, Jacksonville	i	2.75	3.25	3.25	3.00	1.20	1.00	3.25	2.95	3.00	3.00	2.42	2.95	3.35	2.525	2.55	3.25 .15^{43}	3.25 .15^{43}	2.45	2.45	3.05	*	2.65	2.41	2.15	1.50	2.00	....	1.50
Ga, Atlanta	j	2.90	3.45	3.15 .075^{1}		1.55	1.55	3.35	3.125	3.35	3.35	2.85	3.125	3.30 .066^{39}	2.85	2.65	3.30	3.30 .25^{1}	2.25	....	3.00	*	3.225	2.70	3.225	1.70	2.475	2.475	1.77
Ky, Frankfort		2.85	3.50	3.40^{44} .075^{1}	3.40^{44} .075^{1}	1.95	2.05^{44}	3.50	3.00	3.50	3.50	2.75^{44}	3.00^{45}	3.35	2.45^{45}	2.45^{44}	3.45^{44} .10^{44}	3.45^{44} .10^{46}	2.60^{47}	2.60^{47}	3.275^{44} .075^{1}	3.10	3.275^{44}	2.775^{44}	3.275^{44}	2.20	2.425^{44}	2.775^{44}	2.15
Ky, Louisville		3.30	3.75	3.40 .075^{1}	3.40 .075^{1}	2.25	2.45	3.75	3.40 .05^{48}	3.40	3.40	3.30	3.30	3.45 .075^{1}	2.90	2.825	3.45 .10^{46}	3.45 .10^{46}	2.60	....	3.40 .075^{1}	*	3.275	3.275	3.275	3.275	2.45	2.45	....
La, New Orleans	k	2.85	3.325 .05^{10}	3.20 .075^{10}	3.20 .075^{10}	1.60	1.60	2.75	2.985 .05^{10}	3.00	3.00	2.75	2.85 .05^{10}	3.275 .075^{10}	2.50	2.75	3.15 .15^{10}	3.15 .15^{10}	2.77 .075^{10}	....	2.94 .075^{10}	2.94 .075^{10}	2.925 .075^{10}	2.925 .075^{10}	2.925 .075^{10}	1.75	2.925 .075^{10}	2.275 .075^{10}	1.70
Miss, Jackson	l	2.65	3.25	3.00	2.75	1.35	1.35	3.25	2.75	3.25	3.25	2.70	2.75	2.00	2.375	2.375	3.00	3.00	2.00	2.00	2.90	2.80	2.55	2.00	2.80	1.75	2.00	....	2.00
Miss, Meridian	m	2.75	3.00	2.95	2.80	1.10^{4}	1.00^{8}	3.00	2.85	3.00	3.00	2.75	2.375	3.15	2.25	3.00	3.00	3.00	2.00	2.50	2.50	2.80	3.25	2.80	2.80	2.30	2.00	2.00	2.00
Tenn, Nashville		2.725	3.625	2.90	2.80	1.475	1.475	....	3.125	....	3.10	2.55	3.12	3.07	2.75	**	3.25	3.25	2.45	2.45	2.90	....	2.30	2.175	2.75	1.80	1.90	....	....
W Va, Charleston	n	3.175	3.65	3.35 .075^{10}	3.35 .075^{10}	2.15	2.10	3.65	3.25	3.25	3.25	3.15	3.125^{a}	3.40	2.75	2.80	3.35	3.35	3.00	3.00	3.30	*	2.95	2.75	3.30	2.20	2.35	2.25	2.30
MIDDLE WEST																													
Ill, Chicago	o	3.45 .20^{19}	3.825 .075^{10}	3.80 .15^{49}	....	2.775 .075^{10}	2.775 .075^{10}	3.825 .075^{10}	2.73 .23^{10}	3.65	3.65 .10^{10}	3.45 .20^{19}	3.705 .225^{10}	3.65 .22^{10}	3.475 .15^{10}	3.715 .20^{19}	3.53 .24^{50}	3.55 .22^{51}	3.825 .13^{10}	3.825 .13^{10}	3.55 .175^{52}	3.55 .22^{51}	3.40 .05^{10}	3.15 .05^{10}	3.75 .05^{10}	2.16 .12^{10}	3.15 .05^{10}	3.15 .05^{10}	3.00 .075^{10}
Ind, Indianapolis		3.35	3.80	3.40 .075^{10}	3.40 .075^{10}	2.30 .075^{10}	2.45 .075^{10}	3.80	3.45	3.00	3.55	3.175	3.35	3.55	3.20	3.32	3.50	3.50	2.835	2.835	3.39	2.43	2.65	2.98	3.43	2.425	2.43	....	2.45
Mich, Detroit	p	3.25 .40^{53}	3.53 .38^{54}	3.60 .225^{39}	3.37 .10^{55}	2.58 .25^{56}	2.58 .25^{56}	3.00	3.58 .34^{58}	3.58 .27^{59}	3.58 .27^{59}	3.05 .35^{60}	3.47 .43	3.65 .345^{62}	3.125 .225^{63}	3.075	3.635 .14^{64}	3.635 .14^{64}	3.41 .225^{65}	3.05 .35^{60}	3.50 .305^{66}	3.625 .075^{55}	3.35 .25^{57}	....	2.71 .25^{57}	2.61^{67}	3.075 .25^{57}	3.075 .25^{57}	3.075 .25^{57}
Ohio, Cincinnati	q	3.45	3.75	3.50 .075^{1}	3.355 .075^{1}	2.50	2.40	3.60 .15^{39}	3.50	3.45	3.45	3.30	3.45	3.67 .04^{21}	3.25	3.30	3.575 .165^{27}	3.65 .095^{68}	3.30	3.30	3.53	*	3.475	3.225	3.475	2.33^{69}	3.475	3.225	2.55
Ohio, Cleveland	r	3.74	3.715 .10^{10}	3.64 .10^{10}	3.64 .10^{10}	3.00	2.915	3.715 .10^{10}	3.74	3.465 .10^{10}	3.565	3.74	3.74	3.765	3.415 .15^{70}	3.515 .225^{36}	3.64 .10^{10}	3.64 .10^{10}	3.74	3.74	3.665 .075^{70}	3.74	3.49	3.49	3.74	2.625 .10^{10}	3.115	3.365	3.365
Ohio, Columbus	s	3.15	3.65 .075^{10}	3.35 .075^{10}	3.35 .075^{10}	2.25	2.25	3.55	3.32 .03^{71}	3.00	3.00	2.95	3.32 .03^{71}	3.41	2.90	2.70	3.40	3.40	3.175 .075^{1}	3.35 .075^{1}	3.25 .075^{1}	3.35 .075^{1}	3.225	3.225	3.475	2.25	3.475	3.10	2.85
Ohio, Toledo	t	3.57 .07^{10}	3.68 .07^{10}	3.57 .07^{10}	3.54 .07^{10}	2.69 .07^{10}	2.65	3.68 .07^{10}	3.62 .07^{10}	3.44 .07^{10}	3.44 .07^{10}	3.57 .07^{10}	3.62 .07^{10}	3.55 .07^{10}	3.19 .07^{10}	3.00 .07^{10}	3.55 .07^{10}	3.55 .07^{10}	3.20 .07^{10}	3.20 .07^{10}	3.37 .07^{10}	*	3.43	3.29	3.57^{45}	2.30	3.57^{45}	3.155^{45}	....
Wis, Milwaukee		3.30 .14^{72}	3.55 .14^{72}	3.32 .07^{10}	3.32 .07^{10}	2.52 .14^{72}	2.52 .14^{72}	3.55 .14^{72}	3.31 .14^{72}	3.46 .138^{73}	3.30 .137^{74}	3.10 .07^{10}	3.31 .14^{72}	3.35 .19^{75}	3.00 .14^{72}	3.00 .058^{39}	3.36 .14^{72}	3.36 .14^{72}	3.05 .15^{76}	3.05 .15^{76}	3.15 .24^{77}	3.32 .07^{10}	3.10 .07^{10}	3.27 .07^{10}	3.435 .07^{10}	2.42^{69}	2.83 .07^{10}	....	2.74 .14^{72}
WEST OF MISSISSIPPI																													
Colo, Denver	u	3.20	3.75	3.125 .075^{1}	3.125 .075^{1}	2.10	2.10	....	3.375 .125^{78}	3.45	3.45	3.20	3.375 .125^{78}	3.40 .14^{39}	2.975	2.87	3.40^{a} .15^{79}	3.40^{a} .15^{79}	3.10 .10^{1}	3.10 .10^{1}	3.20	*	2.80	2.80	2.95	2.20	2.80	2.80	2.40
Iowa, Des Moines	v	3.125	3.80	3.15 .075^{10}	3.15 .075^{10}	2.375	....	3.80	3.25 .03^{71}	3.00	3.00	3.175	3.225	3.35 .15^{80}	2.87	2.70	3.425 .215^{81}	3.425 .215^{81}	2.65	....	3.10 .15^{80}	3.15 .075^{10}	3.025	3.025	3.25	2.425	2.30	2.60	2.475
Kans, Topeka	w	2.875	3.625	3.20	3.05	2.00	1.85	3.625	3.25	3.10	3.125	2.975	3.125	3.35	2.70	2.85	3.50	3.50	2.775	2.775	3.06	*	2.85	....	3.25	2.25	2.40	....	2.95
Minn, Duluth		2.85 .075^{1}	3.40	3.30	3.05	2.20 .075^{1}	2.20 .075^{1}	3.40	3.22 .075^{1}	....	....	2.85 .075^{1}	3.10 .075^{1}	3.13 .275^{82}	2.75 .075^{1}	2.52 .125^{83}	3.05 .075^{1}	3.05 .075^{1}	2.72 .075^{1}	....	2.975 .075^{1}	*	3.10	2.88	3.32	2.32 .065^{1}	2.77	2.77	2.30 .075^{1}
Minn, Minneapolis	x	3.15	3.575	3.32	3.22	2.40	2.40	3.575	3.25 .23^{84}	3.10 .075^{27}	3.02 .22^{27}	3.25	3.25 .23^{84}	3.25 .357^{85}	3.00 .06^{39}	2.80 0.5^{1}	3.215 .20^{67}	3.215 .20^{67}	3.15^{a}	3.15^{a}	3.25 .225^{86}	*	3.10	2.78	3.22	2.40	2.67	2.77	2.53

		Carpenter	Bricklayer	Ironworker Struc	Ironworker Reinf	Labor Bldg	Labor Hvy	Stone mason	Plasterer	Mosaic & Terr	Tile Layer	Cement Finisher	Lather	Electrn Inside	Painter	Glazier	Plumber	Steam-Fitt'r	Roofer	Waterproofer	Sheet Metal Wkr	Welder	Hoist Eng 1-Dr	Tract Oper 30hp+	Shovel Oper	Truck Dr 1½T+	Air Hvy	Compr Bldg	Air Tool
Minn, St Paul	x	3.15	3.575	3.32	3.22	2.40	2.40	3.575	3.25 23[84]	3.10 075[27]	3.02 22[27]	3.25	3.10 33[89]	3.25 357[90]	3.00 06[29]	2.66 035[86]	3.215 20[87]	3.215 20[87]	3.15[a]	3.15[a]	3.00 30[90]	*	3.10	2.78	3.22	2.40	2.67	2.77	2.53
Mo, Kansas City	y	3.125	3.75	3.20	3.22	2.255	2.305	3.425	3.50	3.425 125[10]	3.425 125[10]	3.125	3.25	3.325 13[91]	3.075	3.25	3.40 09[92]	3.40 09[92]	2.90	2.90	3.35 085[93]	*	2.975	2.975	3.22	2.23	2.825	2.975	2.35
Mo, St Louis	a	3.35 10[10]	3.75 287[94]	3.375 075[10]	3.375 075[10]	2.40 10[10]	2.40 10[10]	3.75 287[94]	3.675 075[10]	3.50 05[95]	3.20 235[96]	3.70 10[10]	3.675 075[10]	3.75 26[96]	3.30 075[10]	3.65 10[10]	3.70 20[97]	3.70 20[10]	3.35 075[10]	3.70 10[10]	3.55 324[98]	2.90[99]	2.90[99]	3.45[99]	3.45[99]	2.60[99]	2.90[99]	2.90[99]	2.90[99]
Mont, Billings	z	2.775	3.50	3.32	3.32	2.20	2.20	3.50	3.125		2.60	2.775	3.00	3.125	2.60	2.30[D]	3.15	3.15	2.625	2.625	2.92 10[1]	3.32	2.55	2.77	2.77[E]	2.33	2.33[F]	....	2.405[G]
Mont, Helena	aa	2.85	3.25	3.00	3.00	2.05	2.15	3.25	3.125	....	2.35	3.00	3.125	3.00	2.65	2.45	3.00 15[20]	3.00 15[20]	2.85 075[1]	2.85 075[1]	2.85 075[1]	2.77	2.55	2.77	2.77	2.14 07[1]	2.33	2.33	2.33
Nebr, Omaha	bb	3.05	3.575	3.20	3.20	2.10	2.10	3.575	3.40	3.20	3.575	3.05	3.25	3.35	2.65	2.475	3.20	3.20	2.60	2.60	2.925	3.15	2.775	2.775	3.125	2.15	2.575	2.575	2.10
N D, Bismarck	cc	2.40	3.30	3.00	3.00	1.55[H]	1.55[H]	3.30	3.02		3.10	2.55	3.00	2.70[I]	2.30	2.30	2.65[J]	2.65	2.25	2.25	2.25[K]	*	2.40	2.07[L]	2.50	1.75	1.83		1.80
Okla, Oklahoma City	dd	2.875	3.80	3.05	3.05	1.95	1.50	3.80	3.50	3.00	3.00	3.10[a]	3.50	3.375	2.80	2.65	3.425	3.425	2.70	2.70	3.05	2.75	2.75	2.75	2.75	2.10	2.75	2.75	2.10
Okla, Tulsa	dd	3.025	3.75	3.225	3.225	2.00	1.75	3.75	3.25	3.25	3.25	3.175	3.25	3.35	3.00	2.90	3.45	3.45	2.55	2.55	3.295	2.80	2.70	2.75	2.75	2.15	2.70	2.80	2.15
Tex, Austin	ee	2.85	3.75	3.125	2.875	1.30	1.30	3.75	3.40	3.50	3.25	2.675	3.40	3.20	2.50	2.50	3.10	3.10	2.30		3.125	*	2.825	3.175	3.175	0.85[M]		2.825	
Tex, Dallas	ff	3.10	3.775	3.175[a] 075[10]	2.875 075[10]	1.625	1.625	3.775	3.56 10[10]	3.00	3.00	3.10	3.56 10[10]	3.375 075[10]	2.937	2.755	3.25 085[93]	3.25 085[93]	2.50	1.90	3.20 075[10]	*	2.925	1.625[N]	1.625[N]	1.625[N]	1.625[O]	2.55	1.775
Tex, Ft Worth	gg	3.00	3.875	3.175[a] 075[55]	2.925[a] 075[55]	1.50	1.50	3.875	3.437 125[55]	3.00	3.00	3.10	3.437 125[55]	3.25 075[55]	2.875	2.75	3.325	3.325	2.50	2.875	3.125 075[55]	3.125 075[55]	2.787	3.187	3.187	1.90	3.187	2.387	1.725
Tex, Houston	hh	3.025	3.75	3.125 075[10]	2.875 075[10]	1.80	1.80	3.75	3.50 105[100]	3.25	3.25	3.05	3.50 105[100]	3.525 15[80]	3.00 075[10]	2.825	3.275 185[101]	3.55 01[27]	2.775	2.775	3.25 075[10]	*	2.80	3.30	3.30	2.075	2.80	2.80	1.975
Tex, San Antonio	ii	3.00	3.375	3.125	3.125	1.375	1.75	3.375	3.495	2.65	2.65	2.90	3.375	3.25	2.75	2.50	3.175	3.175	2.30	1.95	3.175	2.375	2.95	3.15	3.15	1.85	2.75	....	2.75
FAR WEST																													
Ariz, Phoenix	jj	3.19	3.875	3.625 10[1]	3.10 10[1]	2.77	2.77	3.87	3.57 10[71]	3.87	3.625	3.215	3.57 10[71]	3.45 10[27]	2.85 10[102]	2.73	3.35 20[103]	3.35 20[103]	3.13	3.875	3.35 09[1]	3.45 075[1]	2.94	3.115	3.30	2.43	2.515	....	2.515
Calif, Los Angeles	kk	3.225 10[1]	3.80 10[104]	3.40 10[1]	3.15 10[1]	2.50 075[1]	2.50 075[1]	3.80 10[104]	3.937 15[79]	3.465	3.36 15[27]	3.15 10[1]	3.937 15[79]	3.90	3.16 09[1]	3.065 075[1]	3.70 10[1]	3.70 10[1]	3.10 15[27]	3.10 15[27]	3.50 19[105]	*	3.19 10[1]	3.47 10[1]	3.56 10[1]	2.63 075[1]	2.74 10[1]	2.74 10[1]	2.71 075
Calif, San Diego	kk	3.225 10[1]	3.75 10[71]	3.40 10[1]	3.15 10[1]	2.48 075[1]	2.48 075[1]	3.75 10[71]	3.725 13[106]	3.375	3.375	3.175 10[1]	3.725 10[1]	3.50 10[1]	3.03 075[1]	3.70 10[1]	3.70 10[1]	3.70 10[1]	3.00 10[1]	3.10 10[1]	3.30 085[1]	*	3.19 10[1]	3.47 10[1]	3.56 10[1]	2.63 075[1]	2.74 10[1]	2.74 10[1]	2.69 075[11]
Calif, San Francisco	ll	3.175 30[107]	3.95‡ † 525[108]	3.625 10[10]	3.15 10[10]	2.505 10[10]	2.505 10[10]	3.75‡ 45[108]	3.69 40[109]	3.75‡ 45[108]	3.275 165[110]	2.94 075[10]	3.437 20[111]	3.525 26[112]	3.40‡ 165[113]	3.05 16[114]	3.70 46[115]	3.70 46[115]	3.35 325[116]	3.40 165[113]	3.45 34[117]	2.425 065[10]	3.21 10[10]	3.32 10[10]	3.65 10[10]	2.55 10[10]	2.93 10[10]	2.93 10[10]	2.755 10[20]
Idaho, Boise		2.875	3.50	3.125	3.125	2.22	2.22	3.50	3.00	3.50	3.50	2.975[Q]	2.76	3.10	2.75	2.70[O]	3.20 10[20]	3.20 10[20]	3.60	....	2.75	3.075	2.52	2.82	2.87[R]	2.35[S]	2.52[T]	....	2.82
Ore, Portland	rr	2.90 10[1]	3.65 10[1]	3.25 10[1]	3.05 10[1]	2.35 10[1]	2.40 10[1]	3.65 10[1]	3.35 10[1]	3.15 10[1]	3.30 10[1]	3.00 10[1]	3.30 10[1]	3.20 10[1]	2.90 075[1]	3.005 10[1]	3.20 10[20]	3.20 10[20]	3.10 10[1]	3.10 10[1]	3.10 19[27]	*	2.86 10[1]	2.96 10[1]	3.16 10[1]	2.60[a] 075[1]	2.74 10[1]	2.74 10[1]	2.55 10[1]
Utah, Ogden		2.975	3.50	3.125	3.125	2.10	2.225	3.50	3.125	3.00	3.00	2.95	3.125	3.175	2.80	2.56	3.12	3.20	2.85	2.85	2.80	2.95	2.675	2.85	3.10	2.675	2.675	2.55	
Utah, Salt Lake City		2.975	3.50	3.125	3.125	2.10	2.225	3.50	3.125	3.00	3.00	2.95	3.125	3.175	2.86	2.56	3.12	3.20	2.85	2.85	2.80	2.95	2.675	2.85	3.10	2.675	2.675	2.55	....
Wash, Seattle	mm	2.94 10[1]	3.75 10[1]	3.25 10[1]	3.05 10[1]	2.51 10[1]	2.51 10[1]	3.75 10[1]	3.40 10[1]	3.00 10[1]	3.40 10[1]	3.04	3.40 10[1]	3.40 215[118]	2.945 10[1]	2.77 18[119]	3.40 23[120]	3.40 23[120]	3.04	3.04	3.325 20[87]	3.45 075[1]	3.13 20[19]	3.10 20[19]	3.46 20[19]	2.80 175[41]	2.85 20[19]	3.21 20[19]	2.71 10[10]
Wash, Spokane	nn	2.94 10[10]	3.70	3.25 10[10]	3.05 10[10]	2.40	2.40	3.70	3.45	3.42	3.42	3.04	3.45[a]	3.20	3.03 075[10]	2.61 11[20]	3.40 23[121]	3.40 23[121]	3.28	....	3.10 14[122]	3.25 10[10]	2.70 075[10]	2.95 075[10]	3.20 075[10]	2.45 075[10]	2.50 075[10]	....	....
Wash, Tacoma	oo	2.94 10[1]	3.75 10[1]	3.25 10[1]	3.05 10[1]	2.51 10[1]	2.51 10[1]	3.75 10[1]	3.40 10[1]	3.25 10[1]	3.25 10[1]	3.06 10[1]	3.30 10[1]	3.40	2.945 10[1]	2.70	3.40 23[121]	3.40 23[121]	3.04	3.04	3.10 14[122]	*	3.13 20[19]	2.85 20[19]	3.46 20[19]	2.80 175[41]	2.85 20[19]	2.85 10[1]	2.71 10[1]

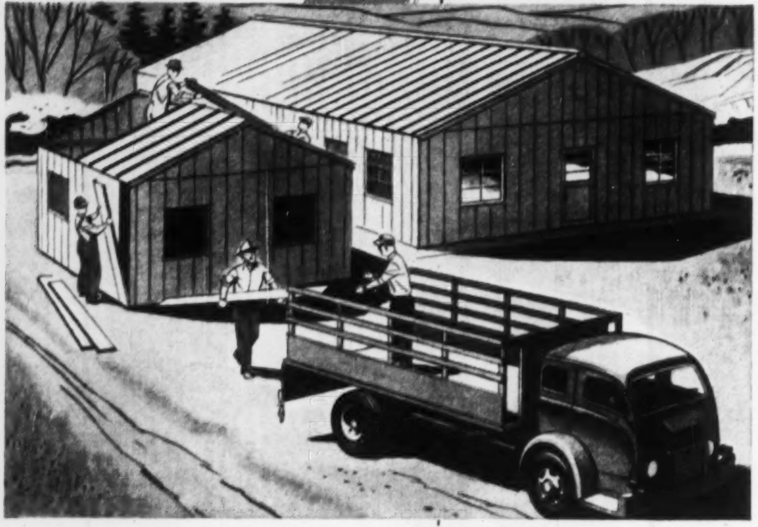
* Same as craft doing work ‡ 7-hr day # 6-hr day *** negotiating † eff 10/1/57

RANGES: [A] 1.10/1.30 [B] 1.00/1.25 [C] 1.25/1.50 [D] 2.30/2.65 [E] 2.77/3.17 [F] 2.33/2.49 [G] 2.40½/2.56½ [H] 1.55/1.70 [I] 2.70/3.10 [J] 2.65/3.25 [K] 2.25/2.80 [L] 2.07/2.40 [M] 0.85/1.25 [N] 1.62½/2.82½ [O] 1.62½/2.00 [P] 1.49/1.74 [Q] 2.97½/3.12½ [R] 2.87/3.17 [S] 2.35/2.55 [T] 2.52/2.57

BENEFITS: [1] H&WF [2] 10¢ H&W, 10¢ PF [3] 15¢ H&WF, 5¢ Advtg [4] 10¢ H&WF, 2¢ Admin, 1¢ Apprent [5] 15¢ H&WF, 10¢ PF, 2¢ Plumb Ind [6] 10¢ H&WF, 15¢ PF [7] 10¢ H&WF, 5¢ PF [8] 5¢ H&WF, 2½¢ PF [9] 4% WF, 3% PF [10] WF [11] 3% WF, 3% PF [11a] 3% WF, 3% PF, 10¢/hr in lieu of PH on straight time only [12] 3% WF, 4% PF [13] 15¢ WF, 11¢ PF [14] 3% WF, 3% PF, 1% EF [15] 3% WF, 2% VF [16] 10½¢ WF, 7½¢ PF [17] 10¢ WF, 1% PF [18] 10¢ WF, 20¢ PF [19] 10¢ WF, 10¢ PF [20] VF [21] PF [22] 5% WF, 3% PF, 6 PH [23] 4% WF, 20¢ PF [24] 5% WF, 3% PF [25] 15¢ WF, 15¢ PF, 20¢ BF [26] 3% WF, 5% PF [27] FB [28] 4% WF, 4% PF [29] 5% W&PF, 4% VF, 1% Nat'l Contrib, 2% SS, 1% Joint Bd Indus, 6 PH and $4/day annuity [30] 3% WF, 5% PF, 10¢ VF [31] 3% WF, 3% PF, 3% VF, 1% Ed F [32] 5% WF, 3% BF, 10¢ SecF, 20¢ PF [33] 3% + 10¢ WF, 3% PF, 2% + 10¢ VF [34] 11¢ WF, 11½¢ PF, 11 PH [35] 10¢ WF, 1% PF, ½, 1% Apprent Train [36] $12/mo per member pd into trust fund [37] 11½¢ WF, 5¢ Apprent, 2½¢ Indus [38] 12½¢ WF, 10¢ PF [39] 10¢ H&WF, 7½¢ PF, 5¢ in lieu of VF [40] 7½¢ WF, 5¢ PF [41] 7½¢ H&WF, 10¢ PF [42] 10¢ H&WF, 7½¢ PF [43] 10¢ WF, 5¢ Joint Indus Bd [44] 7 PH [45] 6 PH [46] 7½¢ H&WF, 2½¢ Ed F [47] 5 PH [48] Advtg Fund [49] 7½¢ WF, 7½¢ PF [50] 9¢ WF, 15¢ PF [51] 7¢ WF, 15¢ PF [52] 7¢ WF, 10¢ PF [53] 10¢ ins, 6% Vac & Hol, 3% PF [54] 10¢ H&WF, 10¢ VF, 3% PF, 2% PH [55] Insur Fund [56] 10¢ H&WF, 15¢ Vac & Hol [57] 10¢ ins, 10¢ VF, 5¢ Hol [58] 10¢ ins, 10¢ PF, 14¢ VF [59] 8¢ ins, 3% VF, 8¢ Hol [60] 10¢ ins, 10¢ VF, 6¢ Hol, 3% PF [61] 10¢ ins, 10¢ PF, 23¢ Vac & Hol [62] 9¢ H, W&ins, 7% Vac & Hol [63] 10¢ group ins, 5¢ VF, 7½¢ PF [64] 7½¢ ins, 5¢ PF, 1½¢ EdF [65] 12½¢ ins, 10¢ VF [66] 10¢ ins, 10¢ VF, 3% PF [67] 2½¢ ins, $2/wk PF, vac & hol pay [68] 7½¢ H&WF, 2¢ EdF [69] Plus $2.25/wk H&WF [70] 10¢ ins, 5¢ PF [71] Prom Fund [72] 7¢ WF, 7¢ VF [73] 7¢ WF, 6.85¢ VF [74] 7¢ WF, 6.75 VF [75] 11¢ WF, 8¢ VF [76] 8¢ WF, 7¢ VF [77] 7¢ WF, 7¢ VF, 10¢ PF [78] 7½¢ H&WF, 5¢ Indus Prom [79] 10¢ H&WF, 5¢ Indus Prom [80] 7½¢ WF, 7½¢ VF [81] 7½¢ WF, 12½¢ VF, 1½¢ EdF [82] 8½¢ H&WF, 4% VF, 1% PF, 1% Train [83] 7½¢ H&WF, 5¢ VF [84] 10¢ H&WF, 10¢ VF, 3¢ Prom [85] 3% H&WF, 7% Vac-Hol, 1% Retire [86] 3½¢ H&WF, 1 wk vac [87] 10¢ H&WF, 10¢ VF [88] 7½¢ H&WF, 15¢ VF [89] 10¢ H&WF, 20¢ VF, 3¢ Prom [90] 10¢ H&WF, 20¢ VF [91] 10¢ WF, 3¢ Apprent [92] 7½¢ WF, 1½¢ Apprent [93] 7½¢ WF, 1¢ Apprent [94] 10¢ WF, 5% VF [95] 7½¢ WF, 5% VF [96] 8¢ WF, 4% VF, 1% PF [97] 7½¢ WF, 7½¢ VF, 5¢ PF [98] 7½¢ WF, 10¢ PF, 4½ gross pay VF [99] 10¢ WF included in base pay [100] 7½¢ WF, 3¢ Prom [101] 7½¢ WF, 10¢ VF, 1¢ Apprent [102] 8¢ HF, ½¢ Admin Health Ins, 1½¢ Opera Committee [103] 12½¢ H&WF, 7½¢ apprent [104] 8¢ H&WF, 2¢ Advtg [105] 9¢ H&WF, 10¢ VF [106] 10¢ H&WF, 3¢ Prom Indus [107] 10¢ WF, 10¢ PF, 10¢ VF [108] 17½¢ WF, 20¢ PF, 10¢ PH, 5¢ Jt Bd [109] 10¢ WF, 15¢ PF, 15¢ VF [110] 7½¢ WF, 9¢ VF [111] 7½¢ WF, 7½¢ VF [112] 10¢ WF, 13¢ VF, 3¢ PF [113] 9½¢ WF, 7¢ VF [114] 7½¢ WF, 8½¢ VF [115] 12½¢ WF, 15¢ VF, 12½¢ PF, 3½¢ Jt Bd, 2½¢ Convalescent Fund [116] 10¢ WF, 15¢ VF, 7½¢ Subsistence [117] 10¢ WF, 10¢ PF, 14¢ VF [118] 7½¢ WF, 14¢ VF [119] 10¢ H&WF, 8¢ VF [120] 9¢ H&WF, 14¢ VF [121] 10¢ WF, 13¢ VF [122] 7½¢ WF, 6½¢ VF

OVERTIME (DT = Double Time; TH = Time & One-Half): [a] DT [b] DT all but (DT Sun & Hol) lab, elec, tr dr, hoist engr [c] DT all bit (TH) lab, [d] DT except (TH maint & repair work) elec; (DT Sat, Sun & Hol) glaz, roof, waterp; (DT Sun & Hol) tr dr [e] DT all but (DT Sun & Hol) lab, cement; (TH) elec [f] DT except (TH) lab, paint [g] DT lab, brick, carp, iron, stone mas, plast, mos & ter, lath, glaz, plumb, sheet met; (DT Sat, Sun & Hol) tile; (DT Sun & Hol) cement, elec, steamf, roof, waterp; (DT Hol) paint [h] DT brick, iron, stone mas, lath, plumb, steamf, sheet met [i] DT all but (TH) lab hvy, mos & ter, tile, paint, roof, waterp, tr dr [j] DT except (DT Sat, Sun & Hol) cement; (DT Sun & Hol) lab, carp, elec, equip oper; (TH) paint, glaz, roof [k] DT except (DT Sat, Sun) lab, stone mas, mos & ter, tile, cement, air tool [l] DT iron, lath, plumb, steamf, sheet met [m] DT elec, paint, plumb, steamf; (DT Sun) carp [n] DT all but lab, paint, glaz, tr dr, air tool [o] DT except (TH 1st 2½ hrs) lab, stone mas, air tool; (TH 4:30PM-7PM) cement; (TH) elec, paint; (DT 12:Noon Sat-8AM Mon, Hol) plumb; (DT 12:Mid Sat-6AM Mon, Hol) glaz, steamf, weld; (DT Sat Sun & Hol) sheet met; (DT Hol) roof waterp, tr dr [p] DT all but (DT Sat & Sun) lab; (DT after 4:30 PM) brick, carp; (DT 6:30 PM-7 AM, Sat, Sun & Hol) shov oper; (DT 6:30 PM-8 AM) cement [q] DT except lab, oper engr, tr dr [r] DT except (DT Sat, Sun) lab, (DT Sun) tr dr [s] DT all but (TH) lab, mos & ter, tile, cement, paint, glaz, roof, waterp, weld, tr dr, air tool, air comp [t] DT except (DT Sat, Sun) lab [u] DT brick, carp, iron, plast, mos & ter, tile, lath, sheet met [v] DT except lab, paint, glaz, roof, tr dr, air tool [w] DT brick, iron, stone mas, plast, mos & ter, tile, tr dr, shov oper, oper engr, air tool [x] DT brick, iron, stone mas plast, lath [y] DT all but (DT Sat, Sun) lab bldg, paint, plumb, steamf, roof, waterp, tr dr, air tool [z] DT brick, iron, stone mas, plast, plumb, steamf, sheet met, weld [aa] DT iron, plast, lath; (DT Sun & Hol) carp [bb] DT except (TH) lab, cement, elec, paint, glaz, roof, waterp, weld, tr dr, air tool [cc] DT Sun, brick, elec [dd] DT brick, iron, stone mas, plast, mos & ter, tile, cement, lath, weld [ee] DT all but (TH 1st 1½ hr) carp; (TH) lab, cement, paint, glaz, roof, sheet met; (DT Sun & Hol) elec, plumb, steamf [ff] DT except (TH) lab, paint, glaz, roof, tr dr, shov oper, tr oper, air comp, air tool; (DT Sun & Hol) carp; (DT Sat & Sun) cement; (DT Hol) elec; (DT Sat, Sun & Hol) plumb, steamf, sheet met [gg] DT all but (TH) lab, plast, mos & ter, tile, paint, glaz, waterp; (DT Sat & Sun) cement, elec, tr dr [hh] DT after 4:30 PM Fri, Sat, Sun & Hol, cement; (DT Sat, Sun & Hol) glaz, tile, mos & ter; (DT Sun & Hol) lab, roof, waterp, air tool; (TH 1st 2 hrs on week day) plumb; (TH 1st 3 hrs) sheet met [ii] DT except cement, paint, glaz, plumb, steamf, roof, waterp, tr dr [jj] DT brick, iron, lath, plumb, steamf, waterp, weld [kk] DT brick, carp, iron, stone mas, plast, lath, elec, plumb, steamf [ll] DT except (THTH 1st 4 hrs) lab; (DT Hol) paint, waterp; (TH 1st 2 hrs) glaz, roof, weld, air tool [mm] DT except (TH 1st 2 hrs) glaz [nn] DT except (TH) lab, carp, paint, tr dr, oper engrs, air comp; (DT Sun & Hol) cement, glaz, sheet met; (DT Sat, Sun & Hol) roof [oo] DT all but (TH lab, hvy, air comp hvy, air tool [pp] DT except (TH) lab, paint; (DT Hol) brick, tile; (DT Sat, Sun) mos & ter; (DT Sat, Sun & Hol) cement, elec, plumb, steamf, sheet met [qq] DT brick, iron, elec [rr] DT brick, iron, plast, mos & ter, cement, lath ,paint, roof; (DT Sun & Hol) tile, sheet met, weld, tr dr, open engrs

PARKERSBURG
METAL BUILDINGS



DOUBLE UTILITY... PORTABLE AND PERMANENT STRUCTURES

The versatility of top-quality, pre-engineered Parkersburg metal buildings cannot be matched by conventional structures, because they can be disassembled and moved to new locations easily and quickly. Whether used as permanent structures or moved from place to place, Parkersburg buildings look better, perform better and last longer because they represent the finest quality that money can buy today. For further information write to Dept. H-1.

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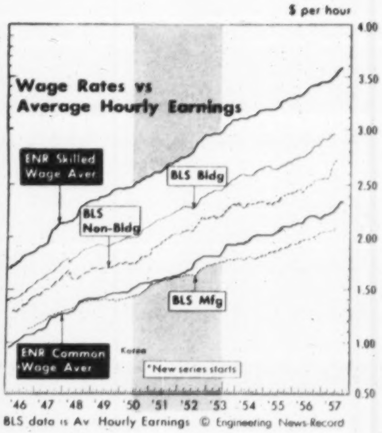
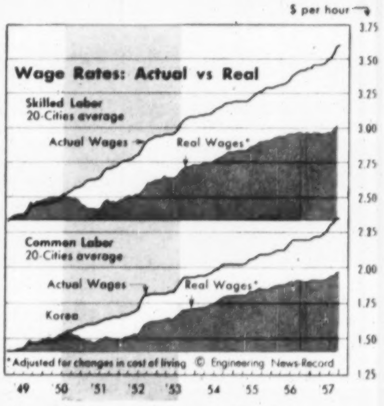


Wage Increases in 1957 Are Bigger Than in 1956

Construction workers won substantially bigger wage increases this year than they did in 1956.

Common labor rates in the ENR 20 Cities increased 14.1 cents per hour, including fringe benefits, during the first 10 months of '57, according to the ENR average for laborers on heavy construction and building work. This compared with an increase of 11.8 cents per hour, including fringes during the first 10 months of 1956. Skilled wages also rose more this year than last

(*Continued on page 167*)



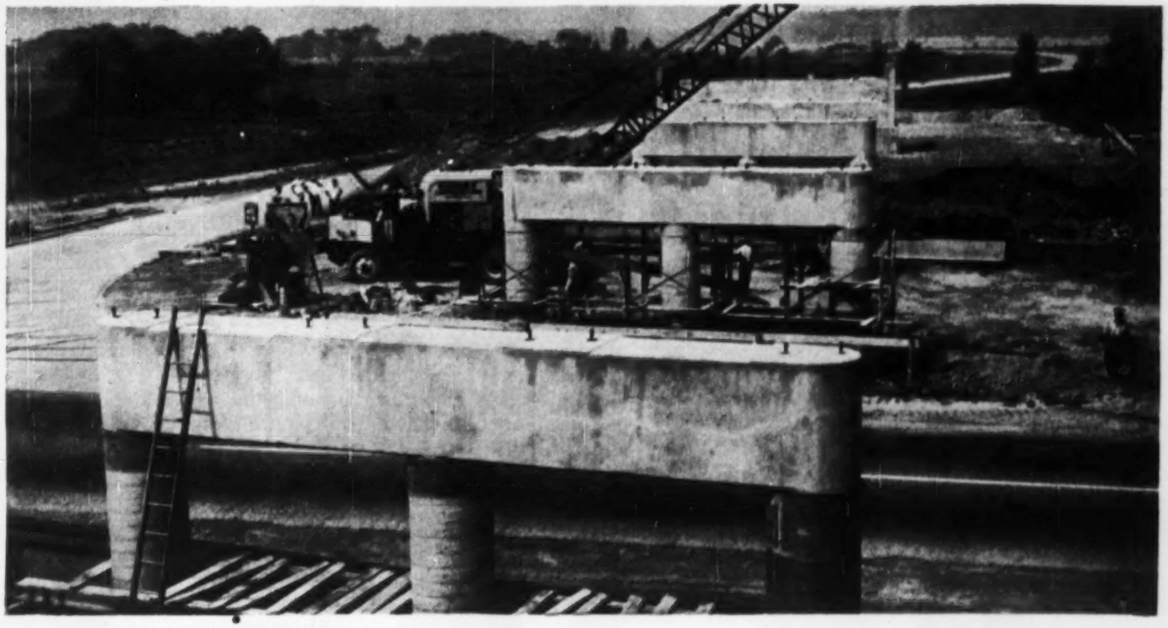
Consumer Price Index

U. S. Bureau of Labor Statistics —1947-49 = 100

	1939#	1945#	1949#	1950#	1954*	1955*	1956*	1957
Jan	59.6	76.1	102.7	100.6	115.2	114.3	114.6	118.2
Feb	59.4	76.0	101.6	100.4	115.0	114.3	114.6	118.7
Mar	59.3	76.0	101.9	100.7	114.8	114.3	114.7	118.9
Apr	59.2	76.1	102.1	100.8	114.6	114.2	114.9	119.3
May	59.1	76.7	101.8	101.3	115.0	114.2	115.4	119.6
Jun	59.0	77.3	102.0	101.8	115.1	114.4	116.2	120.3
Jul	59.2	77.5	101.4	102.9	115.2	114.7	117.0	120.8
Aug	59.0	77.5	101.6	103.7	115.0	114.5	116.8	121.0
Sept	60.2	77.2	102.1	104.4	114.7	114.9	117.1	.....
Oct	60.0	77.2	101.5	105.0	114.5	114.9	117.7	.....
Nov	59.9	77.5	101.6	105.5	114.6	115.0	117.8	.....
Dec	59.6	77.8	101.0	106.9	114.3	114.7	118.0	.....

Pre-depr. high*b* 77.0, Nov 1925—Depr. low; 53.6, Apr 1933.
*For details of latest revision see the February 53 Monthly Labor Review.
#Interim adjusted series converted form 1935-39 = 100 to 1947-49 = 100 base.

STRETCH
road building dollars!



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Fibre Construction Products

and save Time, Labor and Money!

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Sonoco **SONOVOID**® Fibre Tubes

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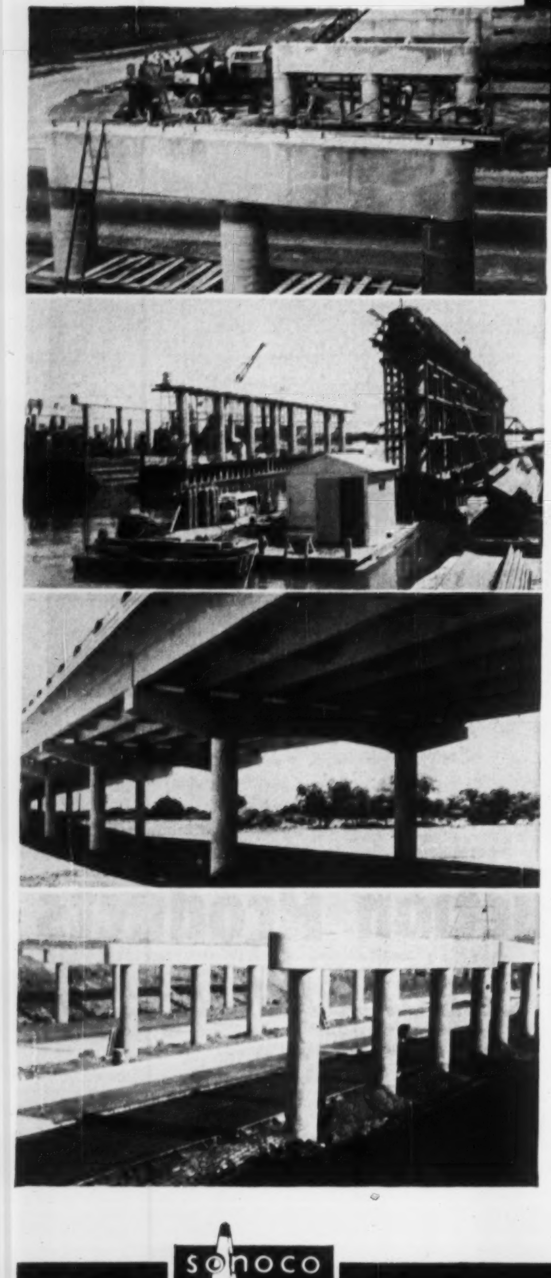
LOWER the COST of BR

use SONOCO SONOTUBE Fibre Forms for round concrete piers



Sonoco SONOTUBE Fibre Forms were specifically developed to provide a fast, economical method of forming round columns of concrete . . . approved by engineers and architects.

Contractors everywhere are saving time, labor and money by using these low-cost fibre forms to erect piers for bridges and overpasses.

Sonoco SONOTUBE Fibre Forms handle easily because they are lightweight and erect quickly because only minimum bracing is required. The recommended method of stripping makes this a simple operation.

These versatile fibre forms are also used for economical encasement of columns, piers and piles, underpinning, stub columns for light standards, quarter, half and obround columns. Beam and wall tie-in is easy.

Save time, labor and money . . . use Sonoco SONOTUBE Fibre Forms!

(Photos top to bottom)

New York State Thruway, Overpass bridge West River Parkway near Grand Island, N. Y. Contractor, Hendrick Construction Company.

North-South Freeway Bridge over Providence River, Providence, R. I. Contractor, M. A. Gammino Company.

Wisner Drive Overpass, New Orleans, La. Contractor, Keller Construction Corporation.

Bridge over State Routes 22 and 23, Circleville, Ohio, Contractor, C. F. Repogle Company.

Order Sonoco SONOTUBE Fibre Forms in sizes from 2" to 48" I.D. up to 48' long. Specify lengths or saw to your requirements on the job. Sonoco's patented "A-coated" SONOTUBE for finished columns; wax-coated also available.

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IDGES and OVERPASSES

use Sonoco SONOVOID® Fibre Tubes to form voids in concrete decks

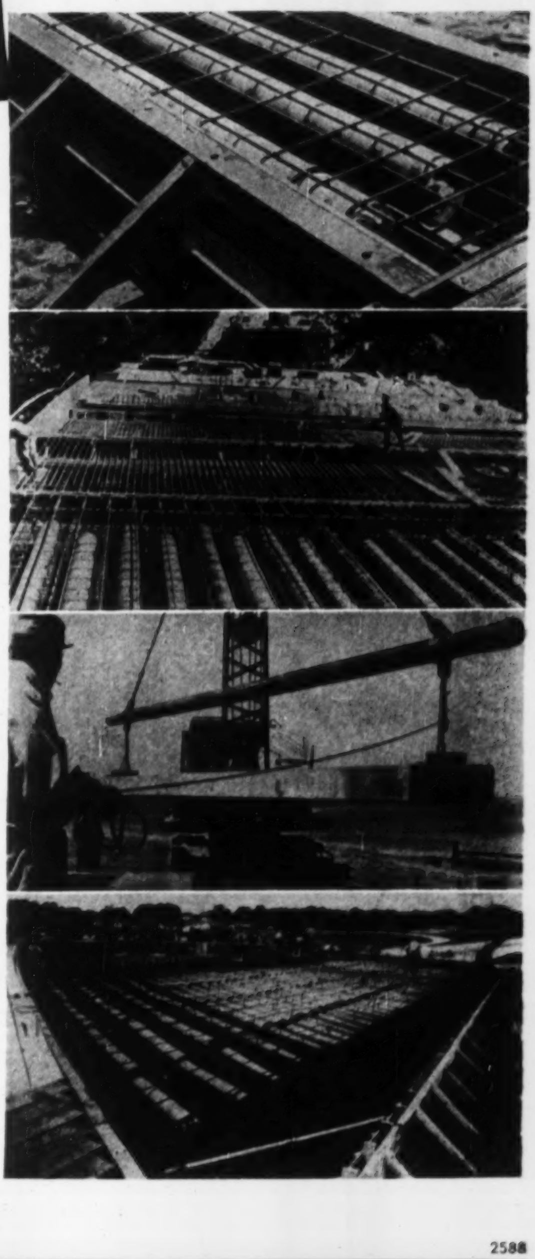
Sonoco SONOVOID Fibre Tubes were specifically developed to form voids in bridge decks and concrete piles and in wall, floor, roof and lift slabs. For precast units or units cast-in-place.

They are particularly adapted for use in prestressed, precast concrete pile construction.

Low-cost Sonoco SONOVOID Fibre Tubes save concrete and reinforcing steel . . . they save weight by displacing low-working concrete at the neutral axis.

The versatility of these fibre tubes is proven in that they have been successfully used as ducts for wiring and piping in building construction and as service conduits to carry electrical, gas and water service through the decks of elevated structures.

Easy-to-handle and simple-to-place Sonoco SONOVOID Fibre Tubes save time, labor, money and materials!



(Photos top to bottom)

Eureka Slough Bridge, Eureka, California. Contractor, Ben C. Gerwick, Inc.

Dog Creek Bridge near Redding, Calif. Contractors, Ukropina, Polich, Kral, Ukropina & Weidmer.

Corning Canal Bridges near Redding, California. General Contractor, J. H. Trisdale.

Waugh Memorial Bridge, Houston, Texas. Contractor, Constructors, Inc.

Order Sonoco SONOVOID Fibre Tubes in sizes from 2.25" to 36.9" O.D up to 48' long. Specify lengths or saw to your requirements on the job. End closures available.

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Sonoco Fibre CONSTRUCTION PRODUCTS

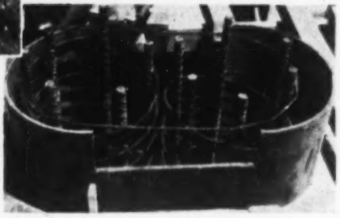
Sonoco SONOTUBE® Fibre Forms

PILE ENCASEMENT — For pile or pier encasement, use special Sonoco SONOTUBE Fibre Form under and above water. Variety of methods.

UNDERPINNING – Set Sonoco SONOTUBE Fibre Form in place, backfill, then pour. Use fibre forms also for exposed supporting columns.

LIGHT STANDARDS — For street, road or bridge lighting, use Sonoco SONOTUBE Fibre Forms to construct base. Utility outlets easily formed where desired.

OBROUND, quarter-round and half-round columns are easily formed with Sonoco SONOTUBE Fibre Forms. Cut as desired, fasten to other formwork. Hold in place with template.

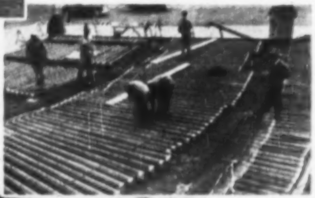


Sonoco SONOVOID® Fibre Tubes

WEEP HOLES created in cast-in-place concrete with small outside diameter Sonoco SONOVOID Fibre Tubes.

FLOOR and ROOF SLABS contain hollows formed by Sonoco SONOVOID Fibre Tubes. Here, 24.85" O.D. tubes are used. Also use in lift-slab or tilt-wall construction.

CANOPY slab voided with 6" O.D. Sonoco SONOVOID Fibre Tubes to meet requirements for long span, lightweight thin slab . . . low upkeep.



SERVICE CONDUIT to carry 10" gas mains across stream was formed by Sonoco SONOVOID Fibre Tubes during precasting of bridge deck beams.

PRECAST CONCRETE PILES, 20" x 20", prestressed and pretensioned with 18⅜" wire cables. Sonoco SONOVOID Fibre Tube, 12" O.D. forms void.

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(Continued from page 162)

—17.1 cents per hour compared with 1956's 13.3 cents average rise.

The wage spiral will continue. Long-term contracts provide for 1958 wage increases for many unions in the ENR 20 Cities.

(Labor Trends cont. on p. 170)

Construction Wages—ENR 20-Cities Averages

SKILLED LABOR, dollars per hour

(Bricklayer, carpenter, ironworker average)

	1926	1932	1939	1945	1946	1949	1950	1955	1956	1957
J	1.24	1.15	1.43	1.64	1.70	2.35	2.46	3.19	3.30	3.46
F	1.24	1.11	1.43	1.64	1.73	2.35	2.47	3.19	3.31	3.46
M	1.24	1.11	1.43	1.64	1.74	2.38	2.47	3.19	3.31	3.46
A	1.25	.95	1.44	1.65	1.76	2.38	2.48	3.19	3.32	3.47
M	1.26	.96	1.44	1.65	1.77	2.38	2.48	3.21	3.34	3.49
J	1.27	.99	1.44	1.66	1.80	2.39	2.52	3.23	3.37	3.51
J	1.27	1.00	1.44	1.66	1.82	2.41	2.52	3.25	3.39	3.54
A	1.28	.98	1.44	1.67	1.83	2.44	2.54	3.26	3.41	3.58
S	1.28	.99	1.44	1.67	1.84	2.45	2.55	3.27	3.42	3.59
O	1.29	.98	1.44	1.67	1.85	2.46	2.56	3.29	3.42	. . .
N	1.29	.97	1.46	1.68	1.86	2.46	2.57	3.29	3.43	. . .
D	1.29	.98	1.46	1.68	1.87	2.46	2.58	3.29	3.43	. . .
Av	**1.27**	**1.02**	**1.44**	**1.66**	**1.80**	**2.41**	**2.52**	**3.24**	**3.37**	. . .

COMMON LABOR, dollars per hour

(Building and heavy construction average)

	1926	1932	1939	1945	1946	1949	1950	1955	1956	1957
J	.54	.45	.68	.89	.95	1.42	1.49	2.02	2.11	2.21
F	.54	.45	.68	.89	.97	1.42	1.49	2.02	2.12	2.22
M	.54	.44	.68	.89	.99	1.42	1.49	2.02	2.12	2.22
A	.54	.41	.68	.90	1.00	1.43	1.49	2.03	2.12	2.23
M	.55	.41	.68	.91	1.02	1.43	1.51	2.05	2.15	2.26
J	.55	.41	.68	.92	1.03	1.44	1.53	2.06	2.17	2.29
J	.55	.41	.68	.92	1.06	1.47	1.54	2.07	2.19	2.30
A	.56	.42	.69	.92	1.07	1.47	1.56	2.09	2.19	2.33
S	.56	.43	.69	.92	1.07	1.48	1.56	2.09	2.19	2.33
O	.55	.43	.69	.92	1.07	1.48	1.57	2.09	2.19	. . .
N	.56	.43	.69	.92	1.08	1.48	1.58	2.09	2.19	. . .
D	.56	.43	.69	.94	1.09	1.48	1.58	2.10	2.19	. . .
Av	**.55**	**.43**	**.68**	**.91**	**1.03**	**1.45**	**1.53**	**2.06**	**2.16**	. .

Averages include fringe benefits—see 1956 wage table by trades for each of 20 cities for nature and extent of these—welfare fund, pension fund and others.

Skilled and Common Wages in 22 Cities

ENR 22-Cities	Hrs per day	Bricklayers			Carpenters			Structural Ironworkers			Common labor (Av bldg & heavy constr)		
		Low	Aver	High	Low	Aver	High	Low	Aver	High	Low	Aver	High
Atlanta	8	$3.25	$3.292	$3.35	$2.60	$2.773	$2.80	$2.95	$2.992	$3.05	$1.38	$1.419	$1.45
Baltimore	8	3.20a	3.433	3.55a	2.925k	3.000	3.025k	3.325k	3.513	3.575k	1.675k	1.675	1.675k
Birmingham	8	3.50	3.500	3.50	2.60	2.625	2.70	3.00b	3.038	3.075b	1.50	1.546	1.55
Boston	8	3.35a	3.517	3.60a	2.925k	3.075	3.15a	3.475k	3.538	3.625k	2.22r	2.320	2.37r
Chicago	8	3.625b	3.669	3.70b	3.375c	3.419	3.45c	3.50b	3.563	3.625b	2.575b	2.619	2.65b
Cincinnati	8	3.45	3.525	3.60	3.15	3.223	3.30	3.275b	3.338	3.425b	2.15	2.225	2.30
Cleveland	8	3.45b	3.575	3.65c	3.40	3.502	3.575	3.40b	3.502	3.575b	2.65	2.726	2.788
Dallas	8	3.625	3.663	3.70	2.875	2.900	2.95	2.95	3.023	3.20b	1.50	1.525	1.55
Denver	8	3.50	3.563	3.625	2.975	3.017	3.075	2.975k	3.054	3.075k	1.925	1.981	2.00
Detroit	8	3.58cd	3.668	3.73cd	3.324l	3.421	3.49l	3.475o	3.575	3.675o	2.55s	2.608	2.65s
Kansas City	8	3.625	3.675	3.70	2.85	2.896	2.95	3.00	3.056	3.075	2.117	2.155	2.167
Los Angeles	8	3.60	3.717	3.80	3.00e	3.067	3.10a	3.325b	3.381	3.50c	2.275k	2.342	2.375k
Minneapolis	8	3.325	3.392	3.425	2.90	2.967	3.00	3.07	3.137	3.17	2.15	2.217	2.25
New Orleans	8	3.175	3.227	3.30e	2.60	2.652	2.725	2.975b	3.033	3.175b	1.475	1.519	1.55
New York	7	4.15f	4.280	4.25f	3.834m	3.888	3.942n	4.18#p	4.235	4.29#p	2.70#n	2.755	2.81#n
Philadelphia	8	3.92g	3.920	3.92g	3.30	3.350	3.385	3.73q	3.730	3.73q	2.175	2.219	2.25
Pittsburgh	8	3.725b	3.808	3.925bd	3.275b	3.338	3.40b	3.375b	3.375	3.375b	2.128a	2.154	2.19a
St. Louis	8	3.925bh	3.939	3.94bh	3.225b	3.317	3.325b	3.225b	3.317	3.325b	2.375k	2.375	2.375k
San Francisco	8	3.75*c	3.873	4.115*i	3.10b	3.152	3.225b	3.35c	3.388	3.50c	2.275c	2.375	2.425c
Seattle	8	3.50a	3.563	3.65a	2.76a	2.888	2.90a	3.07a	3.162	3.17a	2.35a	2.460	2.47a
Montreal	8	2.10	2.10	2.10	1.90	1.90	1.90	2.00	2.00	2.00	1.30	1.30	1.30
Toronto	8	2.558j	2.621	2.71j	2.392j	2.446	2.50j	2.39j	2.445	2.50j	1.40j	1.463	1.56j

*7 hr day •# 8 hr day •a includes 10¢ H&W •b incl 7½¢ WF •c incl 10¢ WF •d incl 10¢ VP •e incl 5¢ WF •f incl 4% WF, 20¢ PF •g incl 17¢ WF •h incl 3% VF •i incl 12½¢ WF, 14¢ PF 5¢ Joint Bd, 5¢ Prom. •j incl 4% VF •k incl 7½¢ H&W •l incl 10¢ ins, 4% VF •m incl 5% WF, 6 PH •n incl 5% WF, 3% PF •o incl 10¢ hosp ins, 5¢ VF, 5¢ PF •p incl 3% WF, 3% PF •q incl 10½¢ WF, 7½¢ PF •r incl 7¢ H&W •s incl 10¢ WF 5¢ VP, 5¢ HP

Wage Rates Including Benefits—New York City

Dollars per hour

Year	Carpenters	Bricklayers	Masons' Laborers	Common Laborers	Structural Ironwkrs
1874	$0.23 (10 hrs.)	$0.43 (8 hrs.)	$0.18 (8 hrs.)	$0.14 (10 hrs.)	
1890	0.43 (8 hrs.)	0.47 (8 hrs.)	0.28 (8 hrs.)	0.14 (9 hrs.)	
1907	0.63	0.70	0.38	0.22 (8 hrs.)	$0.60 (8 hrs.)
1913	0.63	0.70	0.38	0.23	0.63
1930	1.65	1.93	1.03	1.03	1.93
1932	1.33 (7 hrs.)	1.47 (7 hrs.)	1.00 (7 hrs.)	0.65	1.68
1938	1.75	1.89	1.00	0.91	1.93
1939	1.75	1.89	1.03	0.91	1.93
1942	1.85	2.00	1.03	0.95	2.00
1946	2.10	2.25	1.23	1.20	2.25
1947	2.47	2.65	1.44	1.44	2.56
1948	2.73	2.94	1.62	1.63	2.98
1949	2.75	3.20	1.70	1.70	3.00
1950	2.88*	3.30*	1.802*	1.802*	3.14*
1951	3.09*	3.548*	1.957*	1.957*	3.348*
1952	3.152*	3.674*	2.021*	2.021*	3.411*
1953	3.335*	3.858*	2.184*	2.184*	3.591*
1954	3.57*	4.033*	2.415*	2.415*	3.975*
1955	3.637*	4.15*	2.489*	2.489*	4.017*
1956	3.888*	4.28*	2.755*	2.755*	4.235*

*Incl benefits after Sept. 1950

NYC workers get these benefits under new 1957 wag contracts. For benefits under previous contract see pag 128, Dec. 6, 1956.

WELFARE: 5% carpenters**, common labor**, roofers, waterproofers; 4%—bricklayers, cement finishers*, shovel operator*, tractor operator*, hoisting engineer*, air compressor*; 3%—structural ironworker**, mosaic & terrazzo†, lather†, glazier†, steamfitter**; 3% + 10¢ hr—sheet metal worker**; 15¢ hr—plasterers; 5% welfare and pension fund, 1% national contribution, $4/day annuity contribution, 2% SS, 1% joint board assessment—electrician; 12% + 10¢ hr fringe benefits—plumbers; 9% fringe benefit—painter; 8% fringe benefit—tile layers; 10¢ security fund—roofers, waterproofers; 1% education fund—steamfitters.

Also †5% pension; *4% pension; **3% pension

PENSION: 20¢ hr—bricklayers, roofers, waterproofers; 15¢ hr—plasterers; 5%, 4%, 3%—see welfare

BENEFIT FUND: 20¢ hr—plasterers; 3%—roofers, waterproofers

VACATION FUND: 4%—electrician; 3%—steamfitters; 2%—sheet metal workers; 10¢ hr—glaziers

PAID HOLIDAYS: 6 ea—carpenters, electricians, hoisting engineers

COST OF LIVING ESCALATORS: most trades

CONTRACT STATUS: carpenters, common labor, cement finishers, lathers, glaziers, plumbers, roofers, waterproofers, sheet metal workers, hoisting engineers, steamfitters, shovel operators, tractor operators, air compressors, expire 6/30/60; painters, 7/31/59; plasterers, mosaic & terrazzo, 6/30/59; tile setters, 7/30/58; structural ironworkers, 6/30/58; bricklayers, 5/31/58; electricians, 12/31/57.

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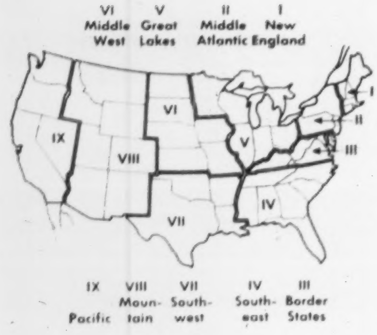


Hourly Earnings Up 15 Cents in 1957

Hourly earnings of workers on contract construction in July '57 were 15 cents higher than in July of last year, according to U. S. Bureau of Labor Statistics data. This increase applies both to workers on buildings as well as those on construction other than building.

Reflecting the bigger gains in wages this year than last, average hourly earnings also moved up more rapidly in '57 than in '56. During the 12 months July '55 to July '56, hourly earnings on contract construction rose 13 cents.

• **Newark holds lead**—Again this year, Newark, N. J., has the highest average wage rates for skilled workers and for helpers and laborers among major cities of the country, according to BLS data for July '56 (latest available). Journeymen's rates average $3.71 per hour (plus fringe benefits compared with the next highest city, New York with $3.66 per hour. Newark's average for laborers and helpers was $2.96 per hour in July '56. New York was second with $2.94.

Average Union Wages, Building Trades, by Area

Bureau of Labor Statistics, July 1, 1956

Trade	United States	I New England	II Middle Atlantic	III Border States	IV South-east	V Great Lakes	VI Middle West	VII South-west	VIII Moun-tain	IX Pacific
All building trades	**$3.04**	**$2.85**	**$3.31**	**$2.82**	**$2.56**	**$3.15**	**$2.97**	**$2.73**	**$2.74**	**$3.00**
Journeymen	3.22	3.07	3.52	3.13	2.83	3.30	3.13	2.95	2.96	3.12
Asbestos workers	3.29	3.17	3.52	3.23	3.03	3.35	3.30	3.17	3.08	3.22
Boilermakers	3.34	3.15	3.73	3.29	3.10	3.35	3.17	3.10	3.20	3.28
Bricklayers	3.62	3.34	3.88	3.49	3.31	3.57	3.69	3.51	3.43	3.66
Carpenters	3.13	2.91	3.51	3.01	2.64	3.26	3.00	2.82	2.91	2.96
Cement finishers	3.11	3.31	3.50	2.89	2.57	3.18	3.25	2.78	2.86	2.95
Electricians (inside wiremen)	3.34	3.15	3.53	3.27	3.01	3.38	3.37	3.10	3.00	3.42
Elevator constructors	3.36	3.23	3.62	3.23	3.03	3.38	3.28	3.16	3.09	3.37
Glaziers	2.93	2.75	3.23	2.89	2.36	3.11	3.04	2.62	2.53	2.82
Lathers	3.43	3.27	3.59	3.28	2.85	3.38	3.21	3.26	3.26	3.55
Machinists	3.34	3.25	3.68	3.25	2.95	3.32	3.25	3.08	2.98	3.21
Marble setters	3.28	3.21	3.38	3.33	3.17	3.36	3.22	3.05	2.89	3.20
Mosaic and terrazzo workers	3.28	3.22	3.56	3.14	3.02	3.26	3.41	2.93	3.20	3.16
Painters	3.01	2.72	3.07	2.84	2.55	3.12	2.94	2.70	2.74	3.07
Paperhangers	2.92	2.91	2.73	2.64	2.68	3.04	2.92	2.57	2.63	3.08
Pipefitters	3.35	3.18	3.63	3.15	3.06	3.35	3.32	3.20	3.12	3.34
Plasterers	3.50	3.37	3.80	3.32	2.83	3.47	3.35	3.24	3.24	3.55
Plumbers	3.35	3.17	3.62	3.15	3.09	3.32	3.37	3.10	3.11	3.35
Rodmen	3.17	3.53	3.56	3.14	2.78	3.32	3.02	2.78	3.00	2.93
Roofers, composition	2.96	3.09	3.35	2.53	2.24	3.21	2.89	2.27	2.95	2.91
Roofers, slate and tile	3.08	3.28	3.34	3.13	2.33	3.23	2.82	2.58	2.79	3.00
Sheet-metal workers	3.20	3.10	3.50	3.16	2.90	3.24	3.23	2.90	2.91	3.18
Stonemasons	3.50	3.41	3.49	3.51	3.32	3.45	3.57	3.57	3.63	3.75
Structural-iron workers	3.30	3.53	3.63	3.38	2.94	3.38	3.12	2.98	3.00	3.17
Tile layers	3.22	3.21	3.33	3.14	2.98	3.30	3.09	2.98	2.94	3.25
Helpers and laborers	2.29	2.23	2.56	1.93	1.57	2.49	2.27	1.63	2.09	2.37
Bricklayers' tenders	2.48	2.22	2.85	1.95	1.56	2.54	2.37	1.67	2.42	2.67
Building laborers	2.20	2.20	2.37	1.90	1.56	2.45	2.19	1.57	1.99	2.30
Composition roofers' helpers	1.96	2.14	2.23	1.95	1.46	2.22	2.25	1.58	....	2.10
Elevator constructors' helpers	2.42	2.26	2.69	2.32	2.12	2.36	2.34	2.21	2.19	2.35
Marble setters' helpers	2.52	2.38	2.76	2.33	....	2.61	2.26	1.77	2.15	2.46
Plasterers' laborers	2.55	2.38	2.83	2.05	1.56	2.66	2.57	1.84	2.44	3.14
Plumbers' laborers	2.35	....	2.37	1.88	1.43	2.55	2.51	1.63	2.32	2.33
Terrazzo workers' helpers	2.60	2.46	2.84	2.17	....	2.65	2.49	1.81	2.08	2.62
Tile layers' helpers	2.51	2.45	2.72	2.29	....	2.56	2.19	1.78	2.15	2.44

Average Hourly Earnings on Contract Construction

Bureau of Labor Statistics, dollars per hour

	Building*							Non building*							Manufacturing						
	1946	1949	1950	1954	1955	1956	1957	1946	1949	1950	1954	1955	1956	1957	1946	1949	1950	1954	1955	1956	1957
Jan.	$1.40	$1.92	$1.98	$2.58	$2.65	$2.74	$2.92	$1.30	$1.71	$1.75	$2.33	$2.31	$2.41	$2.55	$1.00	$1.41	$1.42	$1.80	$1.84	$1.93	$2.05
Feb.	1.42	1.93	1.99	2.59	2.65	2.75	2.91	1.30	1.71	1.77	2.29	2.33	2.44	2.56	1.00	1.40	1.42	1.80	1.85	1.93	2.05
Mar.	1.41	1.93	2.00	2.59	2.63	2.75	2.91	1.28	1.70	1.77	2.27	2.31	2.45	2.55	1.04	1.40	1.42	1.79	1.85	1.95	2.05
Apr.	1.42	1.93	1.99	2.58	2.63	2.75	2.92	1.31	1.71	1.75	2.28	2.34	2.42	2.58	1.06	1.40	1.43	1.80	1.86	1.96	2.05
May	1.43	1.93	2.00	2.58	2.63	2.76	2.94	1.31	1.71	1.76	2.32	2.34	2.44	2.61	1.07	1.40	1.44	1.81	1.87	1.96	2.06
June	1.44	1.92	2.00	2.58	2.64	2.78	2.94	1.31	1.70	1.76	2.31	2.34	2.48	2.62	1.08	1.41	1.45	1.81	1.87	1.97	2.07
July	1.47	1.92	2.01	2.58	2.66	2.79	2.94	1.36	1.71	1.78	2.31	2.36	2.49	2.64	1.09	1.41	1.46	1.80	1.89	1.96	2.07
Aug	1.48	1.93	2.02	2.60	2.67	2.81	....	1.35	1.71	1.79	2.32	2.38	2.51	..	1.11	1.40	1.46	1.79	1.88	1.98	2.07
Sept.	1.51	1.94	2.07	2.62	2.68	2.84	....	1.37	1.73	1.83	2.33	2.39	2.53	....	1.13	1.41	1.48	1.81	1.90	2.01	....
Oct.	1.53	1.94	2.08	2.63	2.70	2.86	....	1.40	1.74	1.83	2.33	2.40	2.55	....	1.14	1.39	1.50	1.81	1.91	2.02	....
Nov.	1.55	1.95	2.09	2.63	2.71	2.87	....	1.43	1.75	1.84	2.34	2.40	2.54	....	1.15	1.39	1.51	1.83	1.93	2.03	....
Dec.	1.57	1.96	2.12	2.65	2.72	2.89	....	1.43	1.78	1.88	2.33	2.41	2.55	....	1.16	1.41	1.54	1.83	1.93	2.05	....

* Series revised March, 1948 to cover both public and private contract construction and to include workers engaged in off-site operations for construction as well as site workers.

Work Injury Rates in Construction, 1955-1956

Bureau of Labor Statistics

	Number of establishments reporting		Injury frequency *a*		Severity rate *b*		Average days lost *c*		1956 Injuries resulting in			1955 Injuries resulting in		
	1956	1955	1956	1955	1956	1955	1956	1955	Death	Perm impair *d*	Temp total	Death	Perm impair *d*	Temp total
Contract construction	5,734	6,008	31.2	34.5	2.33	2.76	85	89	0.8	2.5	96.7	0.8	2.9	96.3
General building contractors	1,836	2,091	34.5	39.8	1.83	2.49	53	60	0.3	2.5	97.2	0.4	2.8	96.8
Heavy construction	367	318	30.9	30.1	3.84	4.41	121	148	1.4	2.5	96.1	1.6	4.4	94.0
Highway & street	603	521	34.2	37.5	3.86	4.88	113	130	1.3	2.9	95.8	1.5	2.5	96.0
Special-trade contractors	2,928	3,078	28.1	31.1	2.04	2.26	85	75	0.8	2.4	96.8	0.6	2.5	96.9
Plumb, heat, air cond	768	799	26.2	28.0	1.02	1.50	39	53	0.3	1.8	97.9	0.4	2.2	97.4
Painting & decorating	309	305	18.6	24.6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Electrical	415	453	21.6	28.0	1.39	1.09	65	39	0.8	1.7	97.5	0.2	2.1	97.7
Masonry, stonework, tile setting & plastering	515	557	29.2	34.5	0.98	1.06	34	31	0.2	1.1	98.7	0.1	1.6	98.3
Roofing & sheet-metal	278	296	53.3	48.6	3.61	4.68	68	96	0.4	1.7	97.9	0.8	3.4	95.8
Structural steel erection	56	74	32.4	41.2	10.86	n.a.	335	n.a.	3.8	5.4	90.8	n.a.	n.a.	n.a.
Misc. spec-trade contractors	587	594	30.2	28.9	2.44	1.93	80	58	0.7	2.9	96.4	0.3	2.6	97.1

•*a* average number of disabling work injuries per million employee-hours worked •*b* average number of days lost for each 1,000 employee-hours worked; because of changes in method of computing time-charge evaluations for permanent-partial impairments, the 1955 injury-severity rates and average days lost or charged per case are not strictly comparable with previous years. •*c* charged to each case •*d* includes permanent-total and permanent-partial impairments; in 1954 and previous years, permanent-total impairments (relatively few in number) were included with deaths

RECORD LOW INJURY RATES IN CONSTRUCTION DURING 1956 were the fruit of the industry's continuing safety campaign.

For all contract construction, injuries fell to a rate of 31.2 per million employee-hours worked, compared to a rate of 34.5 in 1955 and a peak of 41.0 in 1950. The '56 injury rate was the lowest for any year since BLS has kept records.

Injuries declined for general building, highway and special trade contractors. Heavy construction other than highway matched its 1955 record lowest of the four major groups.

truck buyers...

here is the most important
–most thoroughly proved
development ever offered
for faster–safer–
lower-cost trucking

THE ALLISON AUTOMATIC

backed by years in the heaviest military

new low in operating costs—a new high in road

SAVES ENGINES—SAVES DRIVE-LINES—SAVES TIRES—SAVES FUEL

Torque Converter—for smooth tire-saving starts on even the steepest grades. The Allison Automatic puts an end to clutch troubles—eliminates harmful engine lugging—costly shock damage to engines and drive-lines. And, direct-drive lockup engages in *every* gear for maximum fuel economy under all operating conditions.

SAVES BRAKES—INCREASES SAFETY

Integral Hydraulic Retarder— for a new high in trucking safety — a new low in brake and tire maintenance. Just a touch of the toe brings a swirl of oil into action for slowing in traffic and for safer descents on even the steepest grades. It multiplies engine braking power many times—saves brakes for normal and emergency stops. And, there's nothing to wear out.

SAVES TIME—SAVES DRIVERS—SAVES TRAINING COSTS

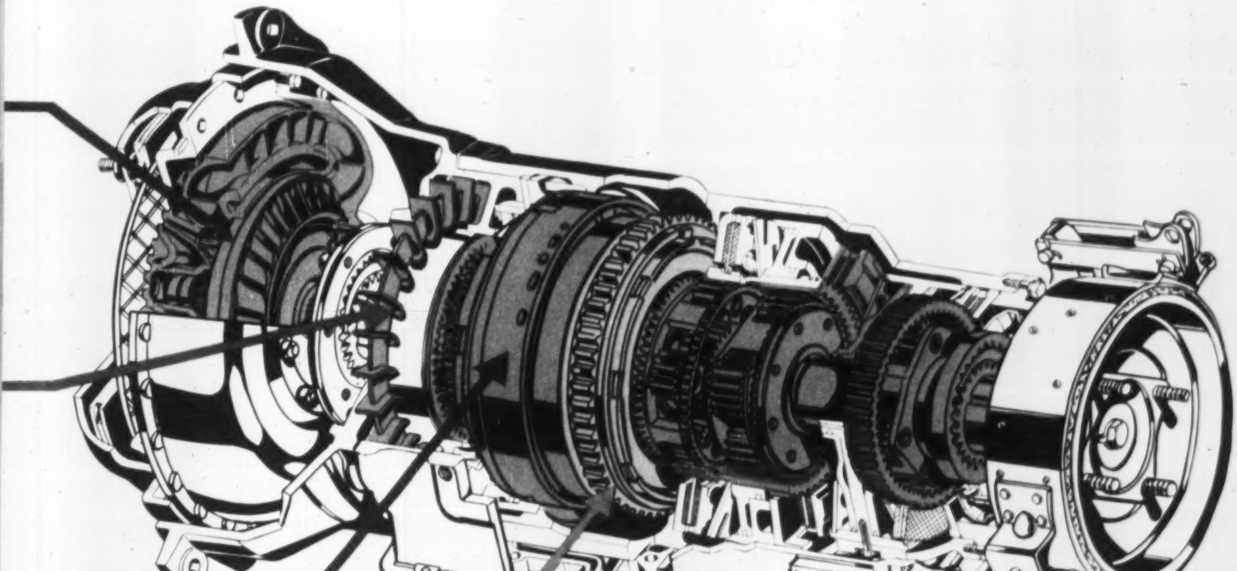
Automatic-Shifting Constant-Mesh Planetary Gear Train—eliminates clutch for easier driving, shorter trip time. Provides six forward speeds featuring TRIPLE-DRIVE RANGE. All clutches are long-life disc type—oil cooled, hydraulically operated and self-compensating for normal wear. No adjustments are *ever* required. Rocking in sand, mud or snow is faster and more effective than ever before. New throttle-over control permits driver to overrule automatic upshift on variable grades. Any driver can be an expert driver with the Allison Automatic.

NEW TRIPLE-DRIVE RANGE

DRIVE 1	A starting and driving range for all normal load, grade and traffic conditions.
DRIVE 2	An ideal driving range for moderate traffic, descending moderate grades or extra-heavy loads over the highway. Good Hydraulic Retarder performance.
DRIVE 3	An intermediate range for heavy traffic or descending steep grades with excellent Hydraulic Retarder performance.

TRUCK TRANSMISSION

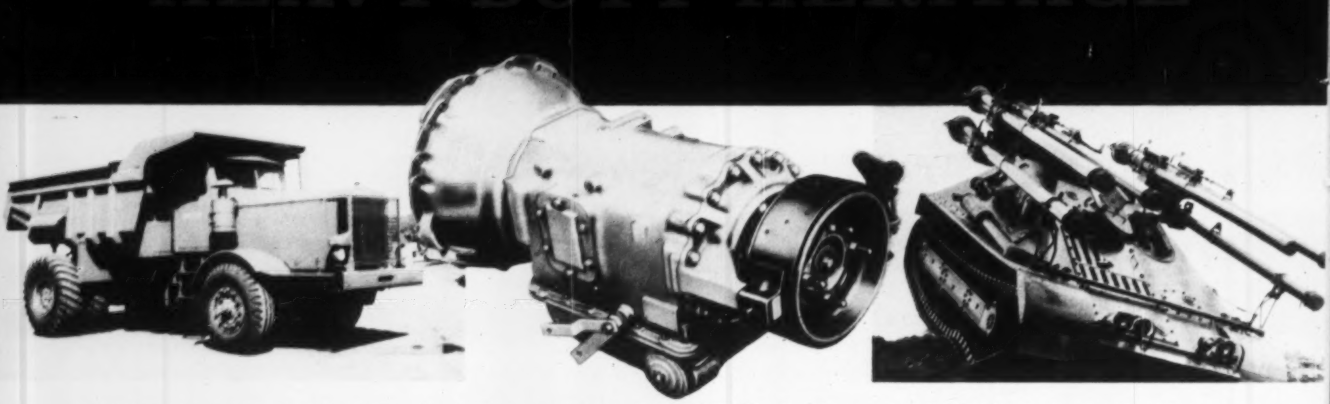
and off-highway hauling now brings a
safety—to medium and heavy-duty highway trucks



Two Power Take-Off Openings – For the first time, here are power take-offs driven through the torque converter for more power and faster operation of auxiliary power equipment. Power application is smoother – the engine is allowed to operate at best speed for maximum power – and, there's less danger of equipment damage due to overload stall.

ONLY THE ALLISON FULLY AUTOMATIC TRUCK TRANSMISSION GIVES YOU ALL THESE COST-SAVING FEATURES

HEAVY-DUTY HERITAGE



Allison Transmissions have revolutionized the operation of heavy-duty haulers like this Euclid 22-ton rear-dump. More than 10 years of service in the world's most rugged hauling jobs has fully proved that trucks equipped with Allison Transmissions haul more payload – faster – safer – and at lower operating cost—than ever before. Every major manufacturer of off-highway haulers equips one or more models with an Allison Transmission.

ONTOS – Greek meaning "the thing" – is armed with more firepower than any other land combat vehicle in history. The maneuverability of this vehicle – made possible by its Allison Transmission – gives the U.S. Marine Corps a highly formidable weapon. Allison Transmissions are also serving with the Armed Forces in all types of wheeled and tracked vehicles including the M-48 Tank, M-51 Tank Retriever and the new Atomic Gun Carrier.

OPERATING DATA

RANGE	GEARS	APPLICATION	TORQUE RATIOS		
			CONVERTER	MECHANICAL	TOTAL
LOW	1-2	Low or Creeper Range to get underway with extra-heavy loads or off-highway operation.	2.8:1	1st Gear—5.296:1 2nd Gear— 3.8:1	**14.8:1**
	TRIPLE	**DRIVE**	**RANGE**		
DR 1	3-4-5-6	A Starting and Driving Range for all normal load, grade and traffic conditions.	2.8:1	3rd Gear— 2.69:1 4th Gear—1.936:1 5th Gear— 1.39:1 6th Gear— 1:1	7.53:1
DR 2	3-4-5	An ideal range for moderate traffic, descending moderate grades for extra-heavy loads over the highway. Good Hydraulic Retarder performance.	2.8:1	3rd Gear— 2.69:1 4th Gear—1.936:1 5th Gear— 1.39:1	7.53:1
DR 3	3-4	An Intermediate Range for heavy traffic or descending steep grades with excellent Hydraulic Retarder performance.	2.8:1	3rd Gear— 2.69:1 4th Gear—1.936:1	7.53:1
N	Neutral	Engine Start Power Take-Off Operation.	2.8:1	P.T.O.— 1.39:1	**3.89:1**
R	Reverse	Reverse.	2.8:1	Reverse — 6.042:1	**16.9:1**

Allison Automatic Transmissions are currently sold by leading truck manufacturers under various trade names. Find out how an Allison fully automatic Truck Transmission can repay its modest cost many times over in *your* trucking operation. See your truck dealer or write:

ALLISON DIVISION OF GENERAL MOTORS, Indianapolis 6, Indiana

Allison **TORQMATIC DRIVES**

Base Rates on Compensation Insurance for Construction—July 1, 1957

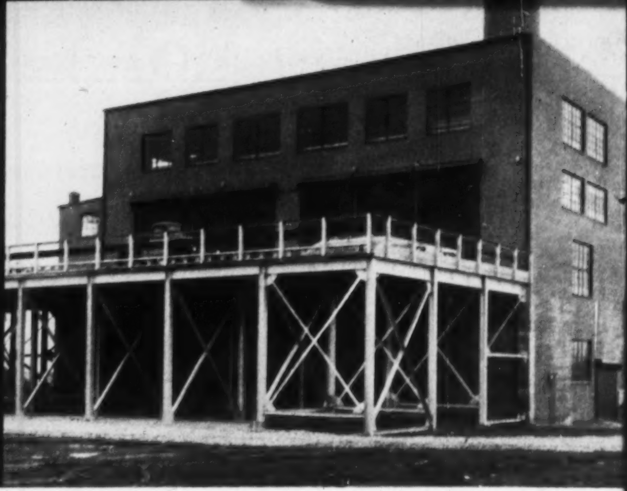
Data Compiled by Herbert L. Jamieson & Co., Insurance Advisers and Auditors, New York, N. Y.—(Base Rates in effect July 1st, 1957—subject to increase or decrease according to experience ratings)

Classification of work	Ala.	Alas.	Ariz.	Ark.	Calif.	Colo.	Conn.	Del.	D. C.	Fla.	Ga.	Idaho	Ill.	Ind.	Iowa	Kans.	Ky.	La.	Me.	Md.	Mass.	Mich.	Minn.	Miss.	Mo.
Carpentry—1-2 Family Residences	$1.47	$3.47	$3.34	$3.03	$2.57	$1.94	$2.94	$1.60	$2.11	$3.48	$2.25	$3.21	$2.31	$1.79	$1.33	$2.40	$1.95	$4.71	$1.48	$2.24	$3.70	$2.48	$2.47	$2.78	$2.48
Carpentry—3 stories or less	1.56	3.95	3.34	3.40	4.75	2.68	3.68	1.60	2.50	3.48	2.25	3.21	3.04	2.00	1.94	2.40	1.95	5.19	1.48	2.24	5.07	2.48	2.47	2.80	2.27
Carpentry Interior trim, cabinet work	.75	2.34	3.34	1.84	4.75	1.26	2.20	1.60	2.13	2.50	1.15	1.63	1.52	1.00	.86	1.38	.97	2.54	.73	1.66	1.88	1.46	2.47	2.12	2.79
Carpentry—General	2.43	7.94	3.34	4.92	4.75	3.46	4.93	1.60	3.43	5.45	3.42	6.68	4.17	2.49	2.60	4.78	2.89	6.31	2.21	4.31	9.96	2.48	3.69	6.14	3.51
Chimney Construction, brick, concrete	5.51	12.22	7.10	13.24	13.48	9.44	14.38	2.00	15.09	14.46	8.23	13.95	9.64	7.83	5.64	11.26	8.40	18.61	4.89	11.23	6.85	9.29	11.75	14.66	14.93
Concrete Work—Bridges—Culverts—C	3.18	7.14	5.44	5.24	3.96	5.15	7.15	2.00	9.22	5.19	4.17	7.33	4.20	3.12	3.49	4.32	2.86	6.72	4.02	5.07	6.24	4.59	5.97	7.00	5.24
Concrete Work—3 stories or less	1.01	6.75	2.66	1.76	1.02	1.43	2.94	2.00	3.78	2.71	.97	2.64	1.35	1.15	1.16	1.60	1.11	2.64	1.44	1.94	4.13	1.38	2.04	1.94	1.59
Concrete Work—General	2.17	7.14	2.66	3.69	3.31	3.20	5.81	2.00	3.73	3.90	2.61	3.57	3.00	2.08	1.80	3.83	1.36	5.29	1.68	2.98	7.68	2.32	2.84	2.86	4.10
Concrete or Cement Walks, Floors	.75	2.76	2.66	1.65	1.38	1.27	3.15	1.50	1.64	2.61	1.54	2.03	1.59	.98	1.05	2.18	1.16	2.87	.91	2.71	2.93	1.21	1.45	1.95	1.78
Electrical Wiring	.94	1.83	2.00	1.90	1.68	1.54	1.74	1.20	1.56	1.93	1.37	1.84	1.38	1.23	.89	1.86	.99	1.87	.71	1.64	2.00	1.21	1.22	1.98	1.83
Excavation—Earth—D	1.84	3.82	3.12	3.44	2.10	3.54	4.97	2.20	3.52	2.78	2.82	5.34	3.43	1.93	1.99	3.91	2.02	3.93	1.86	2.91	4.44	2.15	4.40	5.64	3.63
Excavation—Rock—E	2.65	9.09	5.95	5.99	4.94	6.17	9.17	2.20	6.44	6.89	4.58	5.71	7.47	3.63	2.67	5.38	3.96	8.95	2.46	5.31	8.61	3.96	5.62	6.93	6.96
Glazing	2.10	4.33	3.01	4.69	3.04	3.48	5.44	1.30	4.99	3.54	3.28	4.85	2.82	2.44	2.28	3.92	2.82	5.38	1.95	4.12	5.47	3.25	4.40	5.31	3.94
Insulating	.83	3.50	2.38	1.95	2.43	1.71	2.13	1.60	2.30	2.05	1.02	2.74	1.96	1.39	1.22	1.75	1.07	3.45	1.23	1.69	3.57	1.34	3.04	2.58	2.05
Lathing	.99	3.50	2.31	2.45	1.53	1.65	2.82	.90	2.30	1.93	1.58	2.23	1.34	1.32	1.11	1.80	1.29	3.30	.97	2.00	2.87	1.07	1.65	2.78	1.98
Masonry	1.01	5.95	2.20	1.76	2.14	1.43	3.39	.75	2.11	2.58	1.15	2.64	1.71	1.37	1.16	1.60	1.11	2.64	1.44	2.30	4.13	1.59	1.92	1.94	2.26
Painting & Decorating	1.30	4.77	2.30	2.57	3.38	1.79	3.89	1.60	4.05	2.74	1.77	3.78	2.17	2.19	1.36	2.07	1.91	4.07	1.23	2.55	3.14	1.76	1.89	3.30	2.60
Pile Driving—N.O.C.	4.97	9.10	8.40	12.60	9.13	9.16	6.22	6.00	10.17	10.87	7.73	12.48	8.93	5.19	4.21	10.32	6.37	14.72	2.42	6.50	9.59	6.22	7.69	11.53	8.37
Plastering	.83	3.50	2.38	1.95	1.53	1.71	2.13	.90	2.30	2.04	1.02	2.74	1.32	1.39	1.22	1.75	1.07	2.21	1.23	1.69	3.03	1.34	1.85	2.58	1.48
Plumbing	.95	1.82	1.89	2.10	1.76	1.73	2.07	.75	2.16	2.04	1.69	1.84	1.65	1.45	1.20	1.91	1.00	2.96	.74	2.05	2.25	1.37	1.74	2.03	2.50
Roofing	2.98	8.95	5.60	7.81	6.90	5.11	6.81	1.60	6.71	4.98	3.76	9.31	5.58	4.49	4.92	6.10	3.53	5.98	3.51	6.19	17.57	4.28	7.15	6.50	6.61
Sheet Metal Work	1.45	3.04	2.44	3.17	1.98	1.85	2.95	1.60	2.39	3.05	2.23	2.77	2.13	1.77	1.32	2.13	1.67	3.36	1.04	2.23	2.81	1.51	1.99	3.67	2.15
Steel Erection—Doors & Sash	1.38	4.90	1.80	3.03	3.04	2.35	4.40	6.50	3.73	2.96	1.89	3.11	2.50	2.14	1.53	2.58	1.85	4.76	1.37	2.70	4.15	2.20	2.87	3.71	2.55
Steel Erection—Interior Ornament	1.38	4.90	3.84	3.03	3.04	2.35	4.40	6.50	3.73	2.96	1.89	3.11	2.50	2.14	1.53	2.58	1.85	4.76	1.37	2.70	4.15	2.20	2.87	3.71	2.55
Steel Erection—Structural	5.76	19.60	12.79	14.78	10.55	12.13	11.73	6.50	24.16	11.93	10.63	19.05	10.29	5.62	11.21	13.76	8.59	10.53	6.09	11.80	25.75	10.81	11.14	12.13	10.98
Steel Erection—Dwelling—2 stories	3.20	10.77	4.89	7.32	3.67	5.97	8.33	6.50	8.03	6.69	5.13	9.31	6.45	3.49	3.80	7.04	3.92	8.42	2.91	6.32	12.45	3.81	7.47	8.10	6.94
Steel Erection—General	3.97	11.05	12.79	9.72	4.76	9.85	11.73	6.50	15.50	7.92	9.41	13.33	8.54	5.51	6.00	9.29	4.95	10.53	3.60	8.33	14.90	5.13	9.95	10.05	7.63
Tile Work—Interior	.64	1.11	2.61	1.57	1.05	1.07	1.79	.65	2.11	1.44	.94	1.39	1.04	.86	.74	1.18	.81	1.64	.66	1.37	2.09	.98	1.42	1.80	1.24
Timekeepers and Watchmen	1.44	5.95	4.44	2.84	2.31	2.38	4.20	F	3.24	3.74	2.29	3.21	2.78	1.94	1.62	2.68	1.83	4.90	1.41	2.89	5.48	2.11	3.26	3.27	3.85
Waterproofing—Interior—(Brush)	1.30	4.74	2.30	2.57	3.38	1.79	3.89	1.60	4.05	2.74	1.77	3.78	2.17	2.19	1.36	2.07	1.91	4.07	1.23	2.55	3.14	1.76	1.89	3.30	2.60
Waterproofing—Trowel—Interior	.83	3.50	2.38	1.95	1.53	1.71	2.13	.90	2.30	2.04	1.02	2.74	1.32	1.39	1.22	1.75	1.07	2.21	1.23	1.69	3.03	1.34	1.85	2.58	1.48
Waterproofing—Trowel—Exterior	1.01	5.95	2.20	1.76	2.14	1.43	3.39	.75	2.11	2.58	1.15	2.64	1.71	1.37	1.16	1.60	1.11	2.64	1.44	2.30	4.13	1.59	1.92	1.94	2.26
Waterproofing—Pressure Gun	2.17	7.14	2.66	3.69	3.31	3.20	5.81	2.00	3.73	3.90	2.61	3.57	3.00	2.08	1.80	3.83	1.36	5.29	1.68	2.98	7.68	2.32	2.84	2.86	4.10
Wrecking	7.43	15.99	15.62	18.68	17.87	14.31	15.86	11.00	18.13	15.87	10.35	19.29	13.76	6.02	8.26	10.91	9.75	19.49	7.89	16.04	32.76	9.51	13.59	16.32	17.87

Classification of work	Mont.	Neb.	F Nev.	N.H.	N.J.	N.M.	N.Y.	N.C.	F N.D.	F Ohio	Okla.	Ore.	Pa.	R.I.	S.C.	S.D.	Tenn.	Texas	Utah	Vt.	Va.	Wash.	F W. Va.	Wis.	F Wyo.
Carpentry—1-2 Family Residences	$3.39	$2.11	$4.64	$2.66	$3.00	$3.62	$3.00	$2.38	$2.39	$1.89	$4.62	$4.65	$1.50	$3.24	$2.62	$1.05	$2.72	$3.31	$2.39	$2.19	$1.48	$4.10	$1.95	$2.39	$2.10
Carpentry—3 stories or less	3.39	2.11	4.64	2.84	3.20	4.24	4.40	2.74	2.39	2.11	6.08	4.65	1.50	3.98	2.62	1.05	2.75	3.31	2.39	2.19	1.83	4.10	1.95	3.29	2.10
Carpentry Interior trim, cabinet work	1.70	1.03	2.33	1.17	1.40	2.09	4.40	1.52	2.39	1.05	3.94	2.16	1.50	2.94	1.52	.79	1.54	2.19	2.39	.99	.92	1.35	.97	2.39	2.10
Carpentry—General	5.55	2.89	7.60	2.92	4.20	6.82	4.40	3.99	3.57	2.62	6.59	5.47	1.50	7.88	5.75	2.39	3.54	4.97	2.39	3.25	2.18	5.42	2.89	3.66	2.10
Chimney Construction, brick, concrete	16.01	7.86	21.93	8.52	11.40	15.86	29.60	11.16	11.36	8.25	19.10	A	1.50	25.28	13.42	4.32	11.04	13.24	11.03	6.90	5.46	A	8.40	11.63	9.71
Concrete Work—Bridges—Culverts—C	7.84	3.85	10.74	5.54	5.30	10.15	6.10	3.94	5.77	3.29	11.47	7.18	1.50	10.22	8.34	2.97	4.21	6.81	5.84	4.33	2.02	6.74	2.86	4.62	5.14
Concrete Work—3 stories or less	2.78	1.39	3.81	1.97	2.65	2.01	5.10	1.06	1.97	1.21	3.20	4.26	1.50	5.04	.99	.97	1.54	3.44	2.39	2.22	.95	4.00	1.11	1.68	2.10
Concrete Work—General	4.80	3.11	6.58	3.09	5.30	2.82	5.10	3.53	2.75	2.19	9.92	4.89	1.50	7.44	3.18	1.77	2.92	4.97	2.91	2.47	2.12	4.59	1.36	3.06	2.56
Concrete or Cement Walks, Floors	2.11	1.36	2.89	1.45	2.15	2.52	2.70	1.39	1.40	1.03	3.62	2.34	1.15	3.49	1.90	.94	1.45	2.59	1.29	1.23	.84	2.06	1.16	2.05	1.14
Electrical Wiring	1.90	1.30	2.60	1.56	1.85	3.31	2.50	1.34	1.18	1.30	2.67	2.42	.90	1.65	2.00	.83	1.40	1.82	1.39	1.08	.96	2.27	.99	1.69	1.22
Excavation—Earth—D	5.78	1.99	7.92	2.86	3.70	6.05	5.20	3.21	4.25	2.03	7.17	5.45	1.80	5.49	2.80	1.58	3.65	3.53	3.53	2.69	1.82	4.81	2.02	2.48	3.11
Excavation—Rock—E	6.92	3.68	9.48	4.05	9.50	6.66	8.50	9.02	5.43	3.83	9.06	A	1.80	11.14	6.33	2.49	5.15	8.65	3.72	3.45	3.74	9.32	3.96	5.99	3.27
Glazing	5.20	2.88	7.12	3.24	4.30	5.78	4.50	3.89	4.25	2.57	5.66	4.92	1.60	8.74	4.93	1.89	4.03	3.17	1.32	2.72	2.06	4.61	2.82	4.28	1.16
Insulating	2.91	1.35	3.99	1.91	4.10	3.42	4.40	1.39	2.94	1.46	5.22	4.18	1.50	3.94	2.05	1.21	1.97	3.57	3.40	1.59	.78	3.61	1.07	3.29	2.99
Lathing	2.41	1.38	3.30	1.56	2.05	2.80	2.60	1.86	1.60	1.39	2.75	4.18	.75	4.05	2.31	.98	2.07	1.96	1.99	1.30	1.10	3.61	1.29	1.64	1.75
Masonry	2.78	1.39	3.81	1.97	3.30	2.68	4.20	1.06	1.86	1.44	2.80	4.26	1.15	5.04	.99	.97	1.54	3.44	2.02	2.22	.81	4.00	1.11	1.85	1.78
Painting & Decorating	4.15	1.52	5.69	3.78	4.80	4.21	4.80	2.06	1.83	2.31	3.43	4.88	2.15	3.43	2.36	1.60	2.10	2.77	1.96	1.88	1.53	4.58	1.91	2.31	1.72
Pile Driving—N.O.C.	13.59	6.51	18.62	4.24	6.60	15.24	8.40	8.34	7.44	5.47	17.24	11.60	2.40	9.15	9.04	5.12	11.09	13.05	6.43	3.55	4.76	10.38	6.37	9.62	5.66
Plastering	2.91	1.35	3.99	1.91	2.05	3.42	3.70	1.39	1.79	1.46	3.12	4.18	.75	3.94	2.05	1.21	1.97	2.11	3.40	1.59	.78	3.61	1.07	1.53	2.99
Plumbing	2.00	1.10	2.74	1.39	2.35	2.96	3.00	1.15	1.68	1.53	2.77	2.14	.90	2.05	2.13	.89	1.45	2.50	1.57	1.35	.98	2.01	1.00	1.83	1.38
Roofing	10.04	5.90	13.75	7.86	9.90	9.28	8.90	4.99	6.91	4.73	15.98	11.37	2.50	10.63	6.09	3.63	5.02	8.60	5.28	5.19	3.75	A	3.53	10.25	4.65
Sheet Metal Work	2.90	2.27	3.97	1.88	2.40	3.93	4.30	1.91	1.92	1.87	3.31	4.69	2.50	4.21	2.74	1.19	2.43	2.95	2.42	1.61	1.27	4.10	1.67	2.51	2.13
Steel Erection—Doors & Sash	3.38	1.94	4.63	2.19	4.20	3.95	3.20	2.63	2.78	2.26	5.07	A	4.35	5.71	2.96	1.37	2.91	2.97	1.99	1.84	1.44	A	1.85	3.55	1.75
Steel Erection—Interior Ornament	3.38	1.94	4.63	2.19	4.20	3.95	3.20	2.63	2.78	2.26	5.07	A	4.35	5.71	2.96	1.37	2.91	2.97	1.99	1.84	1.44	A	1.85	3.55	1.75
Steel Erection—Structural	21.12	8.31	28.93	10.03	14.60	16.33	13.80	9.30	10.77	5.92	16.59	18.50	4.35	22.70	15.54	5.95	9.30	13.97	9.08	9.91	4.97	17.35	8.59	9.22	7.99
Steel Erection—Dwelling—2 stories	9.42	4.96	12.91	5.32	5.40	11.43	4.40	5.83	7.22	3.68	11.59	8.80	4.35	13.55	9.04	2.77	4.65	8.89	6.55	4.80	2.87	8.48	3.92	5.37	5.76
Steel Erection—General	14.48	7.15	19.84	8.60	7.80	16.33	10.80	7.67	9.62	5.81	16.59	A	4.35	19.21	8.61	3.15	5.76	8.89	9.08	7.09	3.68	11.55	4.95	9.07	7.99
Tile Work—Interior	1.43	.90	1.96	1.03	1.48	1.85	2.10	.95	1.37	.91	2.04	1.55	.60	2.50	1.41	.69	1.05	1.48	2.15	.91	.68	1.46	.81	1.13	1.89
Timekeepers and Watchmen	3.38	1.99	4.63	2.23	A	3.96	3.60	2.64	3.15	2.04	3.98	3.99	F	5.79	2.78	1.48	2.97	1.48	2.60	1.91	1.61	4.18	1.83	3.48	2.29
Waterproofing—Interior—(Brush)	4.15	1.52	5.69	3.78	4.80	4.21	4.80	2.06	1.83	2.31	3.43	4.88	2.15	3.43	2.36	1.60	2.10	2.77	1.96	1.88	1.53	4.58	1.91	2.31	1.72
Waterproofing—Trowel—Interior	2.91	1.35	3.99	1.91	2.05	3.42	3.70	1.39	1.79	1.46	3.12	4.18	.75	3.94	2.05	1.21	1.97	2.11	3.40	1.59	.78	3.61	1.07	1.53	2.99
Waterproofing—Trowel—Exterior	2.78	1.39	3.81	1.97	3.30	2.68	4.20	1.06	1.86	1.44	2.80	4.26	1.15	5.04	.99	.97	1.54	3.44	2.02	2.22	.81	4.00	1.11	1.85	1.78
Waterproofing—Pressure Gun	4.80	3.11	6.58	3.09	5.30	2.82	5.10	3.53	2.75	2.19	9.92	4.89	1.50	7.44	3.18	1.77	2.92	4.97	2.91	2.47	2.12	4.59	1.36	3.06	2.56
Wrecking	20.84	11.61	28.55	12.92	19.50	23.36	A	12.82	13.14	6.35	18.25	23.63	11.00	29.84	19.13	7.76	13.20	14.74	22.73	10.84	5.94	22.16	9.75	12.53	20.00

*A Specially rated—refer to company. *B Assigned to main classification. *C includes form work. *D Pile driving, caisson and dam work separately rated. *E Special occupational disease loadings apply. *F Subscription to State Fund mandatory: Nevada, Industrial Comm., Carson City, Nev.; Workmen's Compensation Bureau, Bismarck, N. Dak.; The Industrial Commission of Ohio, Columbus, Ohio; State Compensation Commission, Charleston, W. Va.; Workmen's Compensation Dept., State Treasurer's Office, Cheyenne, Wyo.

Exterior view, showing ash tunnel entrance at right center.



Truck ramp and spacious tipping floor outside storage bin.

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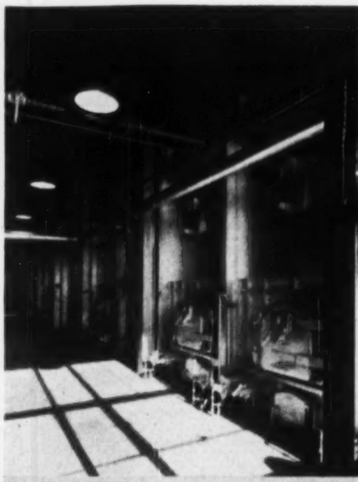


Stoking floor, showing hydraulic stoker controls.

Ash hoppers in drive-through tunnel.

Charging floor, storage bin and crane.

A Surety Bond Check List

- **The types of bonds available and what they do**
- **Their cost for various classes of construction**

Data by Lucy & McNiece General Agency, Surety Bonds, New York, N. Y. Abstracted and arranged by Engineering News-Record. For full details and rates consult your surety company or agency.

Surety Bonds are three-way agreements that are made between the following three parties:

		Under a General Contract	Under a Sub-contract
The Principal,	who is the	contractor	or sub-contractor
The Obligee,	who is the	owner	or contractor
The Surety,	who is the	surety	surety

They provide security to owners covering performance and guarantee payment of labor and material bills to trade creditors. They free a contractors working capital and make useable assets which otherwise might be tied up in certified checks, retained percentages or deposits.

Generally surety bonds are not standardized as to form, thus are flexible and can be designed to provide corporate surety protection against any need, subject only to the financial ability of the Principal to qualify for them.

This means, however, that the provisions should be read and understood in a bond before it is executed, and care taken that the contract to which the bond applies includes all obligations which the bond is required to guarantee.

The most common forms of bonds used by contractors include:

BID OR PROPOSAL BONDS—usually in amount of 10% of bid price.

They guarantee that the contractor, if his bid is accepted:

- **Will execute contract forms**
- **Will furnish the required performance and payment bonds**
- **Or will pay the owner the difference between the low bid and the price the owner must pay the next lowest bidder, if the low bidder defaults.**

PERFORMANCE BONDS—should be for 50% or more of contract price. Regardless of amount of coverage the premium for this type of bond is based on final contract price.

They:

- **Guarantee performance of a contract**
- **Provide indemnity in case of default**
- **May cover a specified, limited period of maintenance** following completion of contract. One year of such coverage is included at no extra premium cost.

The surety is liable only for the contractor's obligations under the contract and bond. Surety companies put construction projects into these four classifications for rating purposes: A1, A, B and Special—see rate schedules for definitions, and check list by type of contract.

Avoid restrictive requirements in bond forms, such as unreasonably limited notices of default, limitation of time for suit, and prohibition of contract modifications not involving substantial changes.

PAYMENT BONDS—may be combined with Performance Bond but are better (and cost no more) when written separately.

They:

- **Guarantee payment for labor and materials used or supplied,** in performing construction contract.
- **May cover contractor's: payroll obligations to subcontractors, materials suppliers including creditors** who deal with subcontractor or contractor.
- **As required under the federal Miller Act may cover subcontractors or material men** who perform any work or supply any material or equipment used in the project, **no matter how far removed from the general contractor.**

MAINTENANCE BONDS—may be combined with Performance Bond but are usually better (and cost no more) when written separately. Coverage for one year is free where a Performance Bond is in effect.

Under other circumstances rates depend upon class of coverage and are nominal.

They:

- **Guarantee** for a stated period of time, **against defects in workmanship and materials**
- **Are usually equal in amount to the value of guaranteed work**

INDEMNITY BONDS—Are used where construction is carried out on the site of an operating facility such as a railroad, or utility. They usually involve "contractual liability" from an insurance point of view.

They indemnify against:

- **Injury to persons or property**—where such bonds are used, the principals should include "contractual liability" riders on their Public Liability and Property Damage Insurance
- **Damage due to disruption of traffic or operations**

In addition, these forms of bonds are used:

INDEMNITY AGAINST LIENS—Bonds taken out before any liens or claims are filed to:

- **Protection against impairment of title or other damage**

BONDS TO DISCHARGE LIENS OF CLAIMS—are taken out after liens or claims are filed.

- **These are financial guarantees, premiums are high and are charged annually until the courts decide.**

PAUPER'S BONDS—guarantee that "imported workers will not become public charges".

RENTED EQUIPMENT and LEASED PROPERTY BONDS are taken our usually for limited period—

- **Guarantee payment of rent, operating costs & labor**
- **Indemnify owner against excessive wear and tear**

JUDICIAL OR COURT BONDS—

- **Provide security for court costs**
- **Pay judgments**
- **Obtain injunctions**
- **Attach property**
- **Discharge injunction or attachments**
- **Discharge liens**

Where given in behalf of defendents these are difficult to obtain and are expensive.

WORKMEN'S COMPENSATION and DISABILITY BONDS—in lieu of or in addition to Workmen's Compensation Insurance—

- **Quality contractors as self insurers,** amount is fixed by law and by determination of owner

MISCELLANEOUS—includes, for example,

- **Bonds to protect owners who allow withdrawal of retained percentage.**

• Rules and Definitions

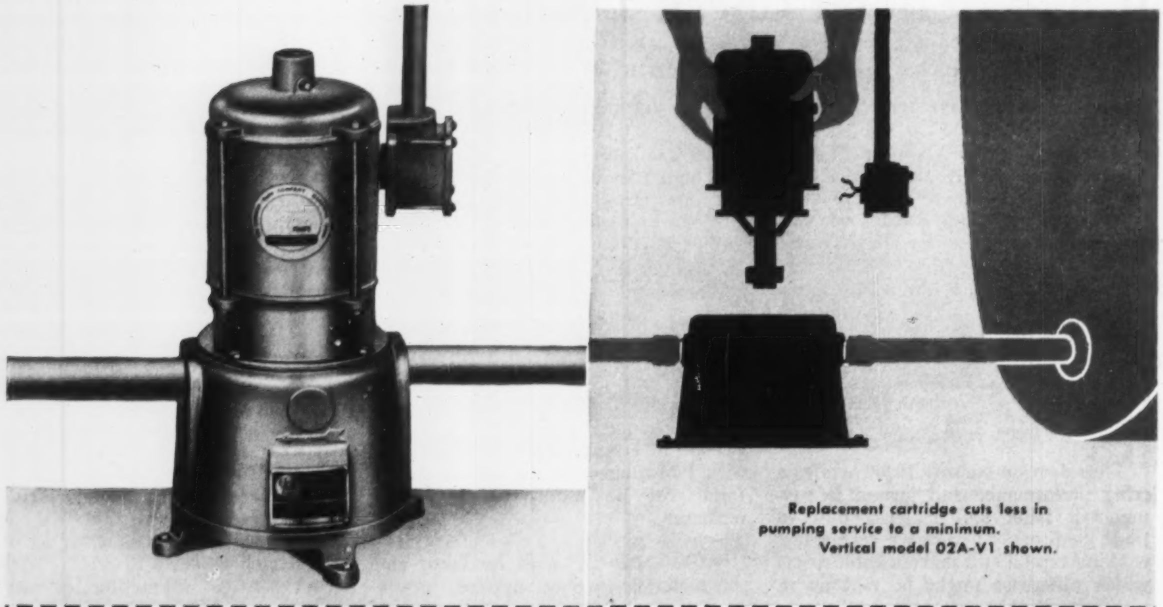
BID BONDS, on contracts where a **Contract Bond is required—**

- **A letter or other consent to become surety constitutes a bid bond,** even when a certified check is used. Regular bid bond "premium" is covered by a $5 per year service charge.

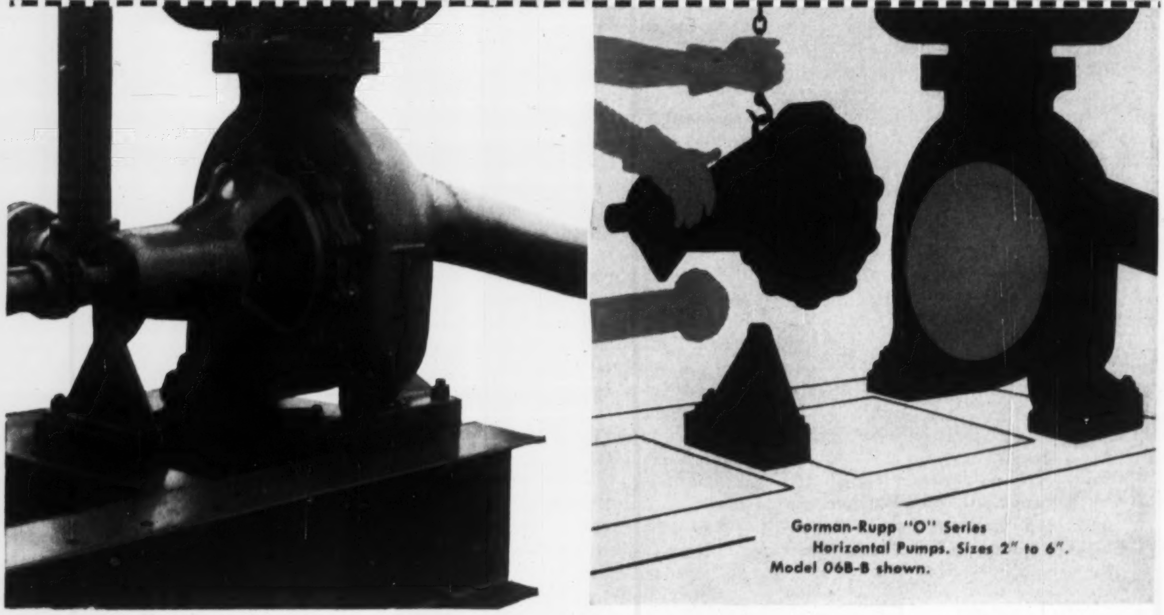
CONTRACT and PERFORMANCE BONDS

- **Contract Price + Extras** is basis for final settlement, exclude time bonus or penalty, include "department" and "fixed" charges. Difference between estimate and final price requires premium adjustment, refund by Surety Company if final price is less, additional payment by contractor if final price is greater than estimate.
- **Contract is susceptible to two classifications**—use higher rate.
- **Separate Contracts** take same classification as general contract—Neither classification nor rate is changed by subdividing work, or by owner or others furnishing materials to contractor.

(Continued on page 179)



Replacement cartridge cuts loss in pumping service to a minimum.
Vertical model 02A-V1 shown.



Gorman-Rupp "O" Series
Horizontal Pumps. Sizes 2" to 6".
Model 06B-B shown.

DON'T BREAK THE PIPING!

Gorman-Rupp's exclusive cartridge design permits rapid field service with less man-hours and spillage control. No need to work back to a fitting or flange. Pump and motor can be removed and exchanged by unscrewing a few bolts right at the pump. This is an every-model feature for all Gorman-Rupp "O" Series *centrifugal pumps that prime*—noted for their high efficiency, dependable operation and unique safety features. No check valves. Covered by the Gorman-Rupp plain language guarantee.

THE GORMAN-RUPP COMPANY

305 Bowman Street · Mansfield, Ohio

. . . Surety bond check list

(*Continued from page 177*)

- **Sub-Contracts** including mechanical take same classification and rates as general contract.
- **Premiums**—Payable in advance regardless of when work starts.
- **Original Premium Earned**: all minimums are fully earned. Original premium on all bonds is fully earned, subject to rules under Contract Price—Extras.
- **Renewal Premium**: where computed on amount of unfinished work, compute the amount of unfinished contract by deducting from total contract the Architects or Engineer's progress estimate for payment to Contractor on the latest date preceding date of annual renewal.

• What Do They Cost?

Premium Rates on Contract Bonds Effective 7-20-55, by The Surety Association of America—Subject to change without notice

PERFORMANCE and PERFORMANCE & PAYMENT BONDS

Rates—Stipulated Completion Time 24 months or 731 days. Over this time, add 1% per month. Fractional months are not prorated.

Lump sum or Unit Price Contracts

Amount of Contract price	Class B All	Class A All	Class A1 Over $2.5 million*
	Rate per M$ of Contract Price		
1st $100,000	$10.00	$7.50	$4.00
Next 2,400,000	6.50	5.00	4.00
Next 2,500,000	5.25	4.00	3.84
Next 2,500,000	5.00	3.90	3.67
Over 7,500,000	4.70	3.60	3.34
Maximum Premium—on aggregate penalty of bond:			
1st 24 mo	$50.00/M	$37.50/M	$25.00/M
For 3rd & subsequent years as of anniversary date	1%/mo	1%/mo	1%/mo

* For Class A1 contracts under $2.5 million: $5.00 per M on contract price for 1st 24 months: thereafter, $2.50 per M on value of uncompleted work. Maximum premium $25 per M on aggregate bonds for 24 months, thereafter $12.50 per M on aggregate bonds annually.

On Class A1 contracts between $2–2.5 million premium does not exceed $10,000 for 1st 24 months.

For Other Types of Contracts

- **Cost plus upset price** or any guarantee of maximum price to owner —same as lump sum contracts
- **Cost plus percentage fee:** $6.00/M on cost to owner for term of bond
- **Cost plus fixed fee:** contracts $2,500,000 or less $3.00/M on cost to owner excluding contractor's fee, for term of bond contracts over $2,500,000 30% of basic rates for lump sum contracts

PAYMENT BONDS ONLY—or for Indemnity Against Liens

Conditions: No Liens have been filed No performance bond is given (Bonds given to discharge liens already filed take Court Bond rates)

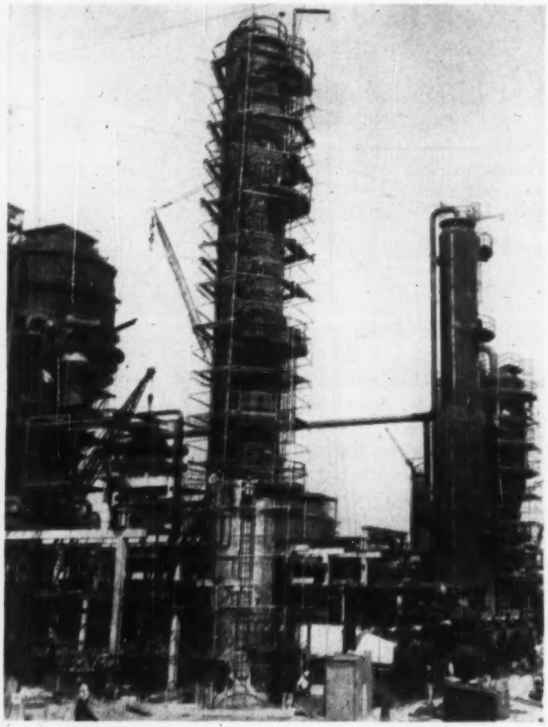
- **On original contract:** $5/M. on contract price for term. Maximum not over $50.00/M on penalty of bond for the term.
- **Contract executed and work partially completed:** $5/M. on aggregate sum of unpaid work, labor and materials plus cost to complete remaining work—Maximum not over $50/M on penalty of bond for the term.
- **Payment bond given after completion of contract:** $10.00/M on amount of bond for the term—May not exceed rate based on original contract.

——Construction Contracts Take These Classifications for Surety Bond Premium Rates——

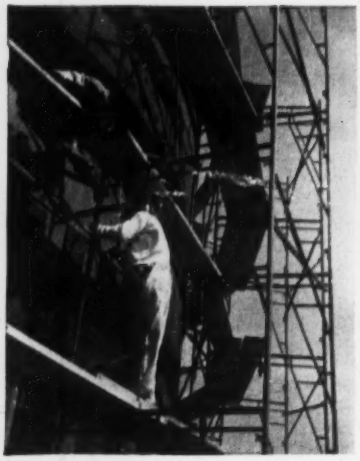
Type of Contract	Classification
Air conditioning	B
Airports, grading	A
site preparation	A
surfacing	A
runways	A
hangars	B
building	B
Alarms, police	A-1
fire	A-1
Aqueducts	B
Ash removal	Spec
Automatic sprinkler systems	Spec
Breakwaters	B
Bridges, complete	A
substructure	A
superstructure	Spec
reflooring	A
painting	A
repairing	A
Buildings, erection, repair, alteration	B
Buildings, prefabricated	Spec
Canals	B
Ceilings, metal	A
acoustical tile	A
Culverts	Spec
Dams	B
Demolition	Spec
Dikes	B
Ditches	B
Docks	B
Draying	Spec
Dredging	Spec
Ducts, underground, for public utilities	A
Electrical work	B
Excavations	B
Filling stations, including bulk storage	B
Fire alarms	A-1
Floors, wood (but not other matls)	A-1
Foundations	B
Garbage disposal plants	B
Garbage removal	Spec
Gas mains, in city streets	B
Gas piping	B
Gas tanks	A-1
Glazing	A
Golf courses	A
Grade eliminations	Spec
Grain elevators	B
Greenhouses	A
Guard rails	A-1
Gunite contracts	B
Hangars, airport	B
Hauling	Spec
Heating and ventilating	B
High pressure power piping	A
Highways	A
Incinerators	B
Iron work, ornamental	A-1
Janitor service	A-1
Jetties	B
Landscaping	A
Levees	A
Locks	B
Machinery (special designs)	A-1
Maintenance bonds	Spec
Masonry	B
Metal windows	A-1
Millwork	A
Murals	A
Ornamental iron work	A-1
Overpasses	Spec
Painting	A
Parking meters	A-1
Piers	B
Piling	B
Pipe lines, oil or gas	A-1
oil or gas, in city	B
water, under or for	B
Piping, high pressure power	A
Planting and cultivation of land	A
Plants, power	B
disposal garbage	B
sewage	B
Plastering	B
Playgrounds	A
Plumbing	B
Police alarms	A-1
Power plants, distribution systems	B
Prefabricated buildings	Spec
Radio towers	A-1
Revetments	B
Roadbeds, for railroads	A
Roads	A
Roofing	A
Sand blasting, buildings	A
Sculptures	B
Seawalls	B
Sewage disposal plants	B
Sewers	B
Shipbuilding	Spec
Shoring contracts	Spec
Sidewalks, curbs and gutters	Spec
Signal systems, railroad	A-1
Signs (all kinds)	A-1
Snow removal	Spec
Spillways	B
Sprinkler systems, automatic	Spec
Stack rooms	A-1
Stand pipes	A-1
Stevedoring	Spec
Stone, cut and dressed (excluding setting)	B
Stone, cut or dressed setting	A
Storage tanks, metal (gasoline or oil)	A
Street lighting systems	A-1
Street paving	A
Structural iron and steel	Spec
Sub-division improvements	Spec
Subways	B
Superstructures, bridge	Spec
Tanks, gas	A-1
Tanks, metal storage	A
Tennis courts	A
Terminals	B
Test borings	Spec
Tile, interior or exterior	B
Timber cutting	Spec
Towers, radio	A-1
water	A-1
Track laying	A-1
Traffic control systems (on public highways)	A-1
Transmission lines (for electrical distribution)	A
Tunnels	B
Underpasses	Spec
Viaducts	Spec
Water carriage of freight	A
Waterproofing (not including gunite)	A
Water towers	A-1
Waterworks	B
Weather stripping	A-1
Wells	B
Wind tunnels	A
Work, labor (on pers. property only)	A-1

Scaffolding Methods . . .

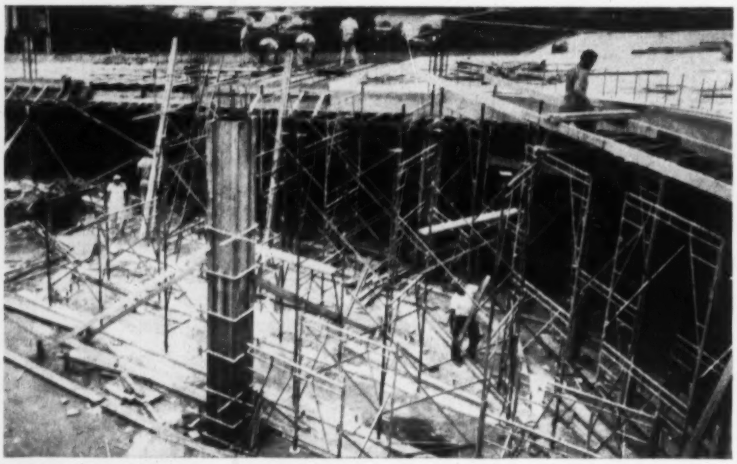
A Picture Report on Efficient Ways To Scaffold and Shore... by Patent Scaffolding Co.



BIG REFINERY JOB — Nearly 15 miles of "TubeLox"® Steel Scaffolding and 3,500 "Trouble Saver"® Sectional Steel Scaffolding frames are used by C. F. Braun & Co., contractor, to get safe, sturdy working platforms for building the new Tidewater Oil Co. Delaware Flying-A Refinery, Wilmington. Note how "TubeLox" Scaffolding provides easy access all over the 155'-high depropanizer column, center.



CLOSE-UP — "Trouble Saver" Sectional Steel Scaffolding surrounds an oil storage tank at the construction scene of Tidewater Oil Co. Delaware Flying-A Refinery, Wilmington. Workmen get close to apply exterior insulation.



SLOPING FORMWORK SUPPORT — Formwork for the concrete pan joist construction of the sloping vehicle ramp at the Arnold Constable Store, New Brunswick, N.J., is supported by 5'-wide "Trouble Saver" Sectional Steel Shoring frames. 160 2'-wide Ladder Scaffolds are also used to support 18"-deep beams varying from 30" to 54" wide. James Mitchell, Inc., is the general contractor.

To help you with your scaffolding and concrete shoring methods, PS offers a complete nation-wide engineering service available to you locally. See the Yellow Pages in your 'phone directory for the latest information, specs, and installation data on all PS Co. Scaffolds, write for free 32-page CATALOG "A"

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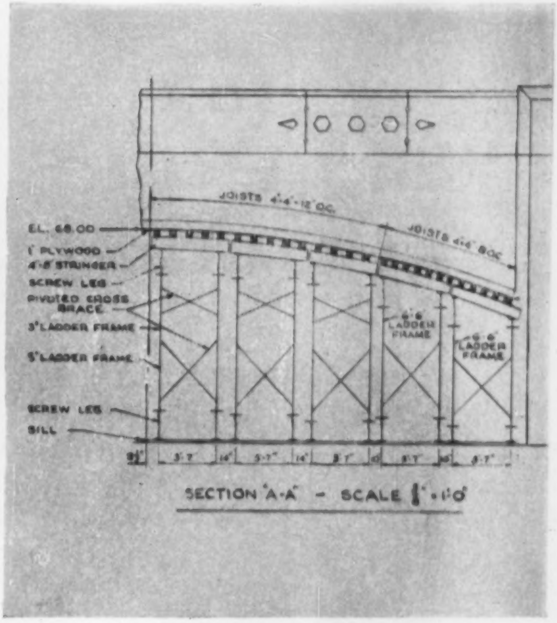
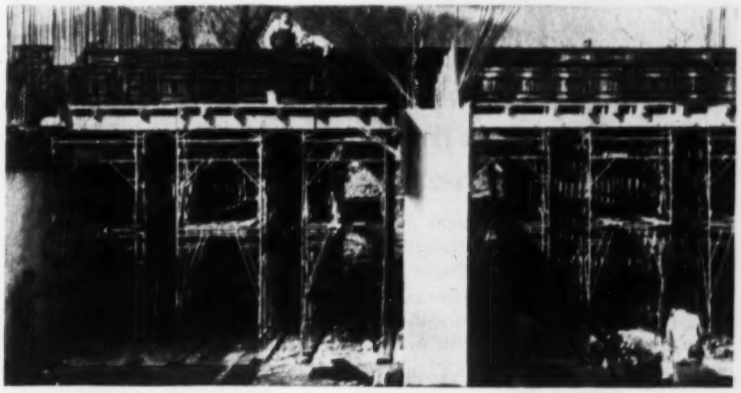
SIMPLE BRIDGE SHORING — Light-weight, easily-erected, prefab sections of "Trouble Saver" Steel Shoring eliminate heavy timbers (and cranes to handle them) for contractor, Matthew J. Reiser, Inc., on this job. 146 2'-wide ladder frames, 105 5'-wide frames and 196 14" U-heads provide ample support with minimum equipment for overpass on an exit road from the Wilbur Cross Parkway, Wethersfield, Conn.



PS Co. ENGINEERED LAYOUTS—Complete, accurate shoring layouts are a regular part of PS Co's engineering service available thru nation-wide offices or representatives that *sell* or *rent* "Gold Medal"® Scaffolds. See classified 'phone directory for your local source. Included are recommendations for joists, stringers, and every component to provide the safest, most efficient and economical shoring.

Shoring Methods . . . for Highway Construction by The Patent Scaffolding Co., Inc.

DUAL PURPOSE—Here, "Trouble Saver" Scaffolding speeds erection of formwork for above-ground pier shells and supports platform for vibrating machines and workers on a New York State Thruway overpass.



CUTS SHORING COSTS 25%—Mal-Bros Co., contractor on this street relocation bridge in Scotch Plains, N. J., formerly used only wood shoring methods. On this project "Trouble Saver" Steel Shoring was used. 272 frames, quickly assembled in 3' by 5' towers and in rows spaced 2'6" apart, provide faster, easier shoring for the job. The contractor reports savings of 25%.

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Company____________________
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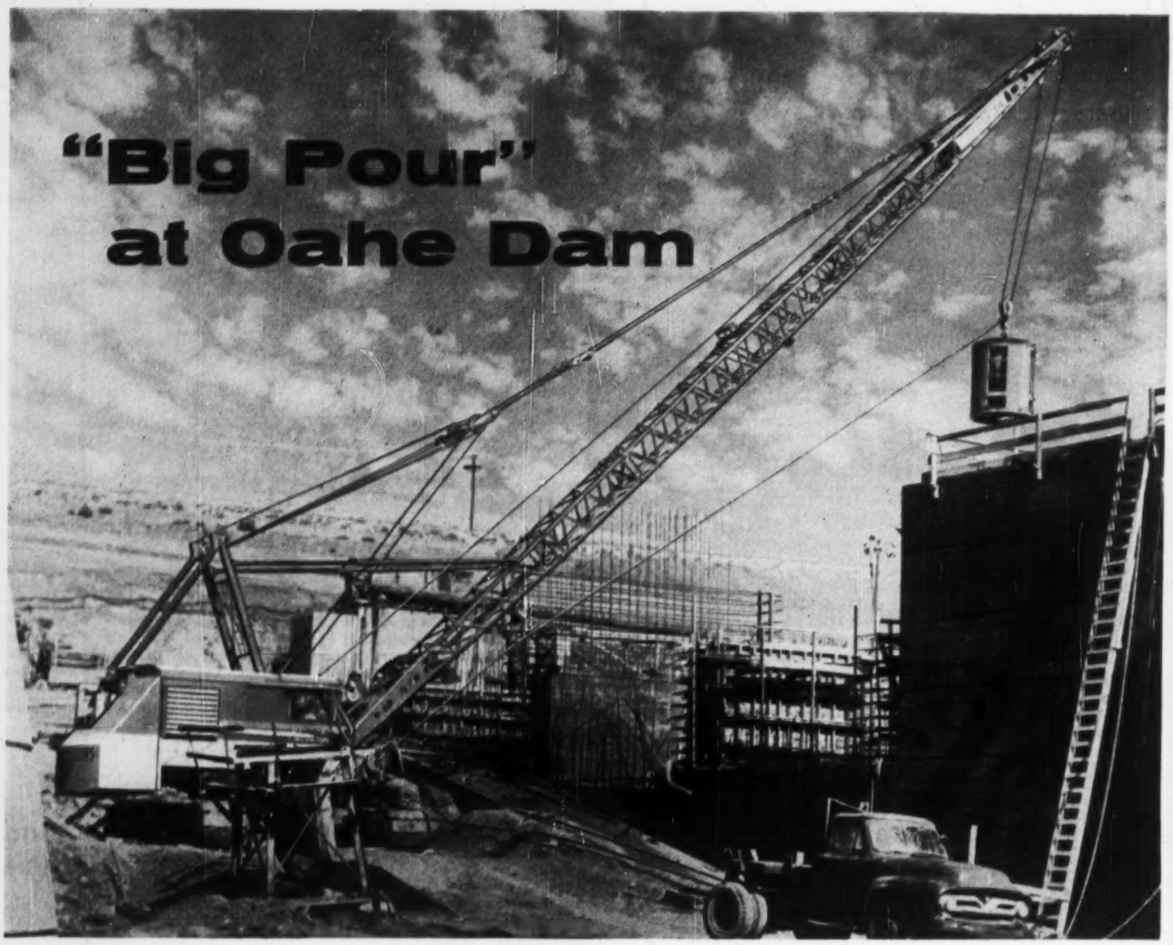
City____________ Zone___ State______



"Big Pour" at Oahe Dam

Manitowoc crane handles almost 115,000 yards of concrete

Pierre Constructors rely on a fast Manitowoc Model 3900 60-ton crane to set the pace spot pouring concrete at the $320,000,000 Oahe Dam Project near Pierre, South Dakota. The company's concrete contract calls for 115,000 yards — most of it handled by the Manitowoc rig equipped with a 100′ boom and a 2-yd. bucket.

Precise Control

Easy-to-operate air controls and smooth torque converter power help the crane operator to hit the forms with absolute precision. The 11,600 lb. bucket is brought to within 6″ of the forms easily and quickly because of the exact "feel" of the air controls. Uniform power flow from the torque converter eliminates all "jump" from crane operation when swinging the heavy concrete bucket over the forms.

Also Sets Stone

In addition to pouring concrete, the Manitowoc 3900 also sets derrick stone. For this exacting operation, the same 100′ boom is used, providing a 45-ton capacity. The crane's wide-spread crawlers and massive carbody, together with balanced design for scientific weight distribution, assure the positive stability necessary for pin-point accuracy.

Performance-Proved

Pierre Constructors also operate a Manitowoc 1¼-yd. Model 2000 Trench Hoe at the dam site. H. B. Bruce, Project Manager for the company says, "Both units have come up to all expectations. We especially like the independent boom hoist on the crane which allows us to lift and at the same time operate in a larger area without shifting the boom or traveling. This not only saves time, but also cuts down on wear and tear on the machine."

You can have outstanding performance like this on *your* next contract. Call your Manitowoc distributor now for full details and informative literature.

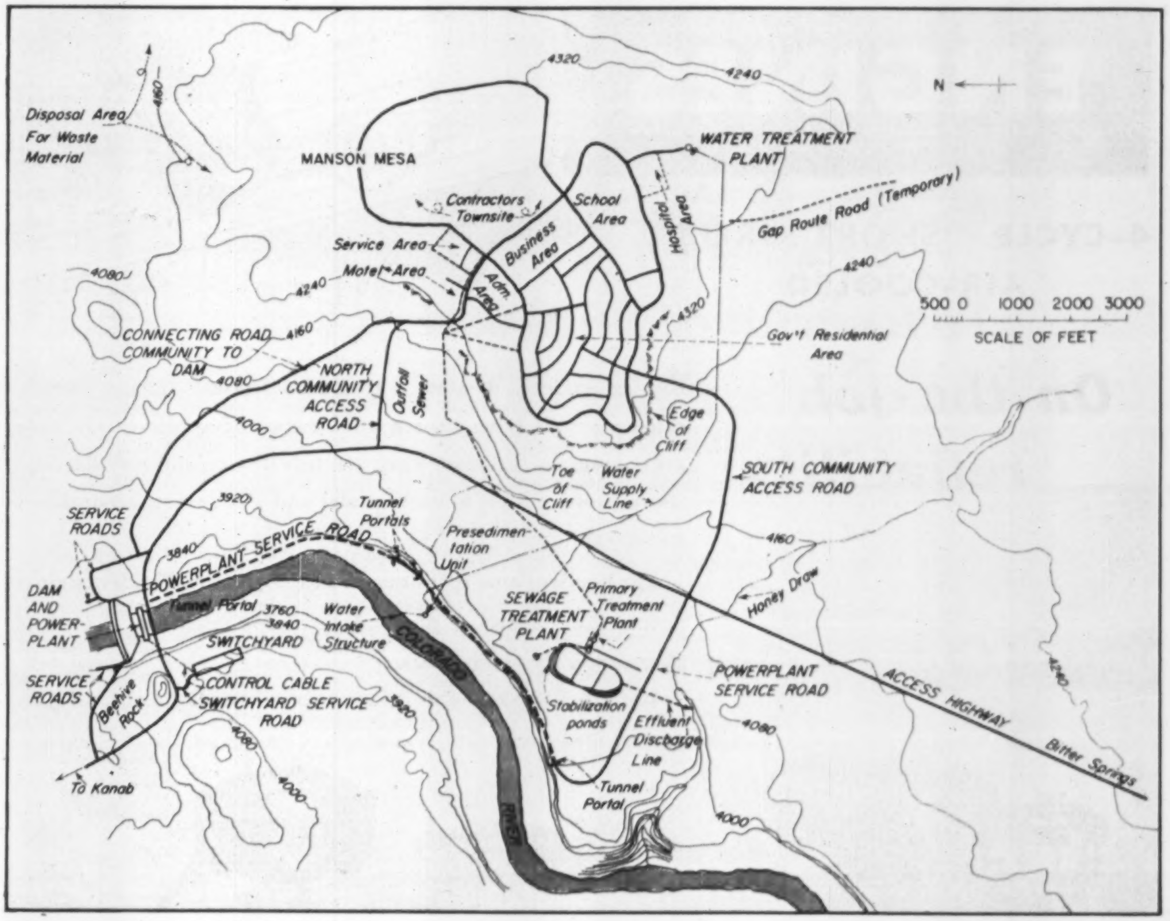
Manitowoc Engineering Corp., Manitowoc, Wis.

SHOVELS
1-5½ YD.

Manitowoc

CRANES
20-100 TON

Unit Prices Bid by Contractors


Disposal Area For Waste Material
4160
MANSON MESA
4320
4240
N
WATER TREATMENT PLANT
Contractors Townsite
School Area
Hospital Area
Gap Route Road (Temporary)
Service Area
Business Area
Motel Area
Adm. Area
4080
4240
4240
500 0 1000 2000 3000
SCALE OF FEET
4320
CONNECTING ROAD COMMUNITY TO DAM
4160
4080
Gov't Residential Area
NORTH COMMUNITY ACCESS ROAD
Outfall Sewer
4000
Edge of Cliff
Toe of Cliff
Water Supply Line
SOUTH COMMUNITY ACCESS ROAD
3920
Tunnel Portals
SERVICE ROADS
Presedimentation Unit
4160
3840
POWERPLANT SERVICE ROAD
DAM AND POWER-PLANT
Tunnel Portal
3760
3840
Water Intake Structure
SWITCHYARD
SEWAGE TREATMENT PLANT
Primary Treatment Plant
Honey Draw
COLORADO
SERVICE ROADS
Beehive Rock
CONTROL CABLE
SWITCHYARD SERVICE ROAD
POWERPLANT SERVICE ROAD
ACCESS HIGHWAY
4240
3920
Stabilization ponds
Effluent Discharge Line
4080
4080
Bitter Springs
To Kanab
4000
Tunnel Portal
RIVER
4000

GLEN CANYON DAMSITE in Arizona showing location of contractor's townsite, access roads, water supply, sewage treatment.

How They Bid on Largest Unit Price Contract

This record breaker, at $107,995,122, is the largest single contract to be let in competitive bidding. It went to Merritt-Chapman & Scott Corp. on a low bid 20.4% under the engineers' estimate and 8.8% under the next bidder.

Glen Canyon is the first and largest unit of the $760 million Upper Colorado River storage project. It is a thin arch, 700 ft high from bedrock, thus second only to Hoover. But it tops Hoover's 3¼ million cu yd of concrete with its 4,770,000 cu yd total in the dam alone.

This is exceeded only by Shasta's 6½ million and Grand Coulee's 10½ million cu yd.

A Bureau of Reclamation job, the contractor has the option of placing concrete in 5 or 7½ ft lifts with cooling pipes embedded between lifts for cooling concrete placed at a specified temperature of 50 F.

The site is approximately 135 miles from the nearest railhead which is located at Flagstaff, Ariz.

It is 13 miles downstream from the Utah border and 13 miles above Lee Ferry where the upper basin starts.

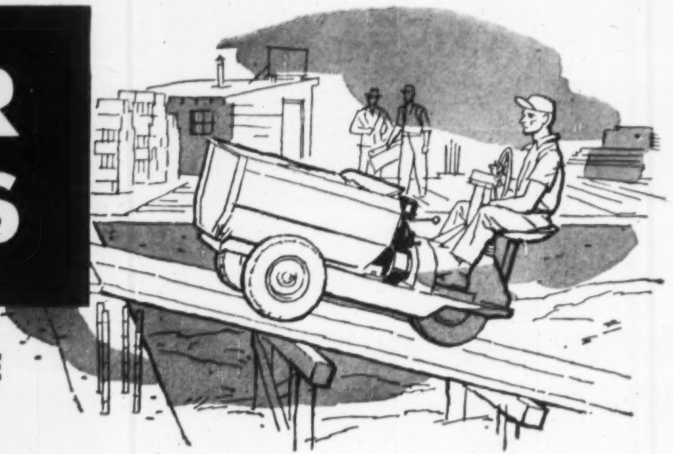
Access roads are currently under construction under other contracts which were let earlier.

The concrete mix will be cement-pozzolan, ½ bbl of each per cu yd of concrete probable but final decision awaits location of aggregate source. The most likely source is situated eight miles up in a side canyon where a haul road would be subject to damage from washouts. Conveyor delivery looks most likely.

The contractor has an escalator clause for labor costs which he will pay in full until May 31, 1959. After that the government pays 85% of added costs or is credited for 85% of savings in the event of wage reductions. Minimum rates set as the job starts include: carpenters $3.03, power tool operators 1 hp and over $3.28, under 1 hp $3.155, cement masons $2.96, electricians $3.325, common labor $2.18, power equipment operators from $2.415 to $3.17 on mucking machines, power shovels. Tractor operators with bull-

(*Continued on page 185*)

KOHLER ENGINES



4-CYCLE SHORT STROKE AIR-COOLED

On-the-job reliability

Kohler engines, in sizes 2 to 24 horsepower, conservatively rated, provide power for a wide range of applications. They are engineered for heavy duty, staunch service, and easy starting. Short-stroke design in each model and size insures smoothness and durability.

The Kohler name is your assurance of quality. Kohler engines power Kohler electric plants, known for reliability the world over for thirty-seven years.

Write for catalog with information about the Kohler engine and its many uses.

K90

K660

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Kohler, Wisconsin

KOHLER OF KOHLER

PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS • AIR-COOLED ENGINES • PRECISION CONTROLS

. . . Glen Canyon Dam

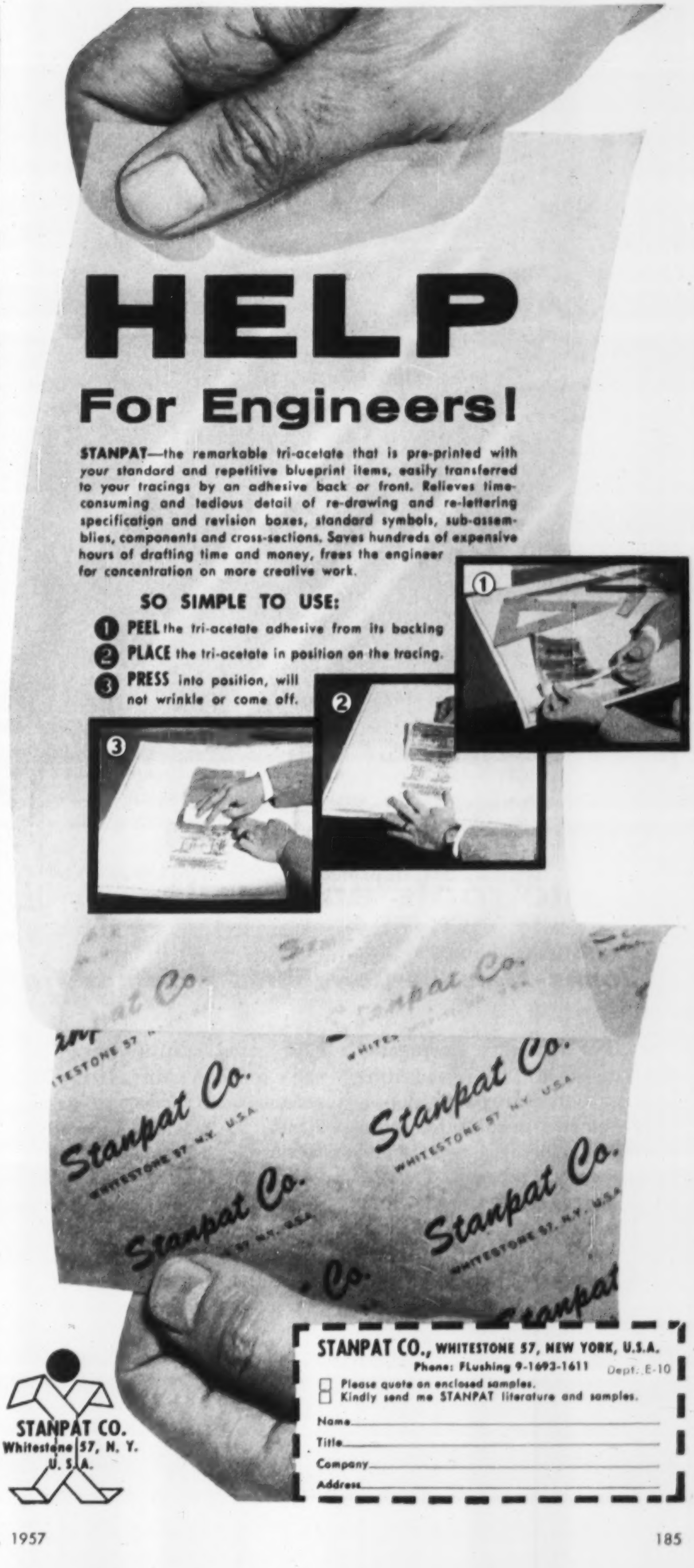
(Continued from page 183)

dozers, tampers or scrapers get $2.995. The bidding included:

1C	Merritt-Chapman & Scott Corp., New York	$107,955,522
2	Glen Canyon Contractors, So San Francisco, Calif	118,336,476
4	T. Rosso & Co., Prescott, Ariz	391,000,000
EE	Bu of Reclamation, Kanab, Utah	135,608,170

Bids: 4-11-57 Items	Unit	Quantity	Unit Prices 1C	Unit Prices 2
Dam, Powerplant, Appurtenant Works				
Div & care of river	ls	job	$3,674,145	$5,700,000
Remov rk slbs, can walls	cy	15,000	10.00	17.80
Exc, com op cut, 1st 500,000 cy	cy	500,000	3.30	3.90
over 500,000 cy	cy	485,000	0.60	1.90
rock, 1st 800,000 cy	cy	800,000	5.00	6.96
over 800,000 cy	cy	850,000	1.50	4.00
all cl, op cut div tun	cy	130,000	3.00	3.90
spillways	cy	950,000	4.00	1.22
com, op cut, switchyard	cy	16,700	5.00	1.20
rock, op cut, switchyard	cy	24,200	5.00	2.50
drill line holes	lf	158,000	1.00	1.25
all class, tunnel div	cy	182,000	20.00	15.00
spillway	cy	132,000	20.00	16.00
foundation	cy	4,500	30.00	48.00
control	cy	3,200	35.00	49.00
Steel, struct perm tun supports f&p	lb	780,000	0.30	0.26
Tun roof support bolts f&i	lf	13,000	6.00	2.95
Chain-link fabric, tunnel roof support f&i	sy	3,000	9.00	2.70
Backfill	cy	343,000	1.00	1.10
Constr embank swyard	cy	17,600	2.00	0.38
Rockfill adj to PP	cy	850	15.00	9.00
Riprap	cy	11,000	2.50	3.90
Compact backfill	cy	18,000	2.00	1.75
Drill holes in stage core				
NX 0-50'	lf	250	6.00	8.90
50-100'	lf	250	6.00	8.90
100-200'	lf	500	7.00	8.90
5½" holes 50' & less	lf	200	9.00	18.50
grout 0-30'	lf	48,000	4.00	2.50
30-60'	lf	15,000	3.50	2.60
60-110'	lf	12,000	3.50	2.90
110-160'	lf	7,000	3.50	3.25
160-210'	lf	2,000	4.00	3.60
210-260'	lf	1,500	4.00	4.00
260-310'	lf	1,000	4.00	5.00
310-360'	lf	500	4.00	5.20
Met pipe & fitg, fdn grtg & drainage f&p	lb	318,000	0.60	0.58
Hook-ups fdn tun grt holes	ea	1,800	20.00	26.00
Pres grtg fdns & tunnels	sax	44,000	3.00	3.00
Met tubing & fitting, grout contract joints f&i	lb	755,000	0.75	0.60
Hook-ups, contract jnt grtg system	ea	700	30.00	55.00
Pres grtg contract jnts & cool system	sax	45,500	3.00	2.40
Drill drnge holes in stage				
0-25'	lf	8,000	5.00	4.00
25-50'	lf	7,200	5.00	4.00
50-75'	lf	6,000	5.00	4.50
75-100'	lf	5,000	4.00	4.50
100-150'	lf	2,000	4.00	5.85
150-200'	lf	1,000	4.25	7.00
200-250'	lf	500	4.25	8.00
spillway tun 25' or less	lf	18,000	6.00	8.00
Const SP drns op jnts, 8"	lf	750	4.00	5.50
SP, calked jnts f&l	lf	500	5.00	7.00
split drns cemt jnts	lf	1,000	10.00	4.75
Porous concrete	cy	20	150.00	125.00
Drill, anch & grt bars ip	lf	44,000	2.50	1.90
Cement f&h	bbl	120,000	6.60	7.00
Spec finish conc surfaces	sy	4,400	20.00	38.50
Reinf bars, detail f&p	lb	19,900,000	0.15	0.19
f&p	lb	9,000,000	0.15	0.19
Conc dam 1st 2,400,000 cy	cy	2,400,000	11.00	15.38
over 2,400,000 cy	cy	2,370,000	9.50	5.75
sidewalks & parapets	cy	1,600	120.00	88.50
elev twrs & vista canops	cy	1,000	150.00	160.00
gate hoist & stem storg platform & gate erect platform	cy	170	70.00	88.00
trashrks & gate hst strct	cy	17,000	130.00	138.00
2nd stage ring-follower gate chmbrs	cy	500	20.00	44.00
blockouts	cy	1,900	100.00	140.00
floors splwy chan downstr from downstr tun port	cy	4,200	25.00	29.00
spillway hoist bridges	cy	470	90.00	192.00
crests splwy intake struc	cy	7,000	35.00	33.35
walls & piers, splwy intake struct	cy	17,000	30.00	33.35
lining right div tun	cy	16,000	36.00	57.00
left div tun	cy	17,000	37.00	51.00
splwy tun upstream	cy	44,000	40.00	75.00
right splwy tun downstr	cy	15,500	40.00	48.50
left	cy	17,500	40.00	47.00
tun plugs & bkfill conc	cy	33,000	30.00	25.00
gutters & drop inlets	cy	200	50.00	160.00
penstk sup & vaults	cy	10,000	35.00	55.00
floors of fdn tunnels	cy	800	16.00	48.00
mass beneath mach shop	cy	24,000	10.00	14.00
riv outlets valve struct superstr	cy	180	90.00	110.00

(Continued on page 187)



HELP For Engineers!

STANPAT—the remarkable tri-acetate that is pre-printed with your standard and repetitive blueprint items, easily transferred to your tracings by an adhesive back or front. Relieves time-consuming and tedious detail of re-drawing and re-lettering specification and revision boxes, standard symbols, sub-assemblies, components and cross-sections. Saves hundreds of expensive hours of drafting time and money, frees the engineer for concentration on more creative work.

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2. **PLACE** the tri-acetate in position on the tracing.
3. **PRESS** into position, will not wrinkle or come off.

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STANPAT CO., WHITESTONE 57, NEW YORK, U.S.A.
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☐ Please quote on enclosed samples.
☐ Kindly send me STANPAT literature and samples.
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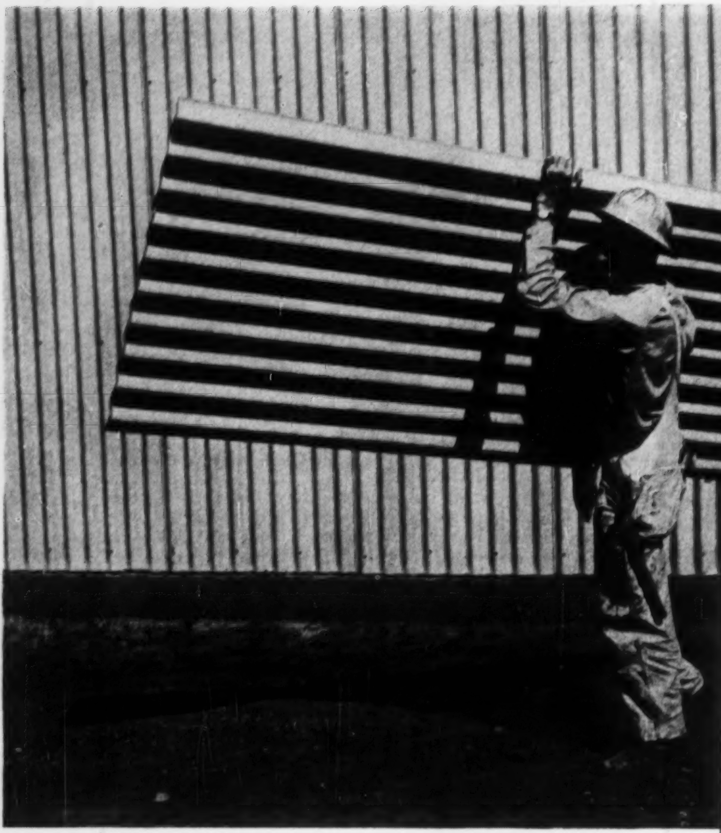

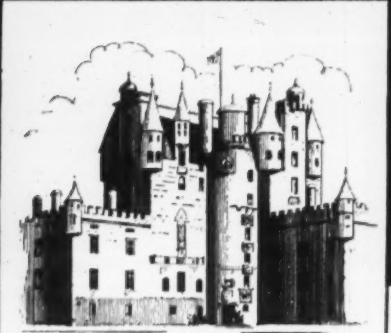

Constructed of stone in 1675-87, Glamis Castle in Scotland has withstood the ravages of weather and time. Glamis is the ancestral home of Queen Elizabeth of Great Britain.

Build years of service into roofs and walls

Johns-Manville Corrugated Asbestos Transite® wears like stone

For durability, Corrugated Transite is one of the most lasting building materials ever developed. Made of two practically indestructible minerals—cement and the ageless rock, asbestos–Transite looks and wears like stone. Like the famous old stone castles, original installations of Corrugated Transite are still giving service and protection under conditions which destroy other forms of roofing and walls.

Corrugated Transite can't burn, can't rot, can't rust. It has high resistance to acids, to gaseous fumes, to severe temperatures, to vermin and insects.

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For more specific information, write Johns-Manville, Box 158, New York 16, N. Y. In Canada: 565 Lakeshore Rd. East, Port Credit, Ont.

Johns-Manville congratulates the American Institute of Architects on its 100th Anniversary.

—Consult an architect—use quality materials.

Johns-Manville

. . . Glen Canyon Dam

(Continued from page 185)

Bids: 4-11-57 Items	Unit	Quantity	Unit 1C	Prices 2
gravity-type walls	cy	9,200	17.00	24.00
line drilled-type walls	cy	7,600	25.00	32.00
mass around riv outlet p & in vlv struct substr	cy	19,000	10.00	18.00
mass for PP struc, exc mach shop	cy	80,000	12.00	12.00
1st stage in PP substr	cy	35,200	14.00	48.00
intermed struc	cy	45,400	50.00	60.00
structures	cy	550	55.00	70.00
1st stage PP superstr	cy	5,400	120.00	196.00
Cip or precast PP superstr walls	sf	52,600	6.00	10.00
drill core spec, conc 10"	lf	220	60.00	45.00
met p or tubg & ftgs, conc cool sys, 1" OD f&p	lf	4,650,000	0.27	0.24
std p & ftgs, 1½" f&p	lf	180,000	0.60	1.00
Construct tp A control jnts	lf	600	10.00	3.00
Joint filler, bit ½" f&p	sf	750	2.00	2.25
sponge rub, ½" f&p	sf	750	4.00	4.50
2" f&p	sf	4,400	5.00	7.50
corkboard, 1" f&p	sf	52,000	1.00	2.25
½" f&p	sf	1,600	0.80	3.25
Rubber jnt strips with met straps f&i	lf	510	8.00	4.50
without met straps f&i	lf	1,000	5.00	4.00
Rubber water-stops, tp D f&p	lf	250	4.00	4.50
tp E f&p	lf	3,100	5.00	6.75
tp F f&p	lf	8,000	5.00	4.00
Metal seals in dam f&p	lf	124,000	3.00	2.20
tp N2, PP f&p	lf	12,000	3.00	6.00
Met grt groove covers f&p	lf	54,500	3.00	1.00
Construct asph seals	lf	1,900	7.00	20.00
Conc flr hardener f&a	sy	6,500	1.50	0.70
Membrane wtrproof f&p	fs	24,000	1.00	1.00
Asph-emul dmpprfng, 2 ct f&a	sy	1,400	2.00	1.70
Precast-conc rf slabs f&i	sf	65,000	1.50	2.00
Roof insulation f&p	sf	62,000	0.80	0.75
Asph-sat blt-up rfng, 4-ply f&p	sf	67,000	0.60	1.20
Sand fills for PP roofs	cy	1,200	7.00	7.50
Protect timb cov for PP rfs f&i	Mcm	135	400.00	440.00
Asph brd & fabric rfng f&p	sf	10,700	1.00	1.20
Stl for PP superstr f&e	lb	4,250,000	0.20	0.34
Alum rolling door f&i	sf	600	10.00	13.50
Aluminum windows f&i	sf	7,250	7.00	9.00
Fixed strmprf louvers f&i	sf	75	6.00	35.00
Operable strmprf louv f&i	sf	300	9.00	37.50
Automatic louvers f&i	sf	400	12.00	40.00
CI soil P & fitgs f&i	lb	184,500	0.60	0.52
CI bell traps f&i	lb	3,900	0.60	1.10
CIB&S&F pipe, wall pipes & fittings f&i	lb	160,000	0.35	0.70
WIP & ftg 2" & less f&i	lb	3,000	1.00	0.90
2½" & less f&i	lb	80,500	0.75	1.20
Valves 2" & less f&i	lb	50	20.00	4.00
draft, tube drn, 2½" & over f&i	lb	20,000	1.50	4.20
draft-tube drain f&i	vlv	8	3,000	850.00
MP, ftgs & valves i	lb	705,500	0.50	0.48
Gratgs for draft tube piers f&i	grtg	16	600.00	750.00
Oil storage tanks, 4 i	ls	job	20,000	3,900
Metalwork, nonembedd i	lb	141,000	0.25	0.45
embedd i	lb	72,470	0.30	0.45
Anchor bolts i	lb	61,000	0.50	0.75
Stairways i	lb	232,000	0.30	0.48
Trashracks & slot clos i	lb	1,880,000	0.14	0.06
Pipe handrails i	lb	12,800	0.75	0.40
Track for 190-t gantry crane i	lb	197,000	0.20	0.07
Chain-link fences f&e	lf	70	8.00	7.50
PP & mach shop, misc metalwork f&i	lb	330,000	0.74	0.65
Cranes f&i	ls	job	45,000	250,000
Testing cranes	ls	job	20,000	15,000
Pens outlet p & bell-mouths i	lb	21,000,000	0.14	0.15
Gate fr & anchor bolts bulkhead i	ls	job	20,000	10,000
fixed-wheel i	ls	job	85,000	120,000
Blkhd gate, outlet wrks i	ls	job	15,000	3,600
Fixed-wh gts, penstk intk, 8 i	ls	job	240,000	200,000
Hi-press gts & met trans i	ls	job	75,000	35,000
Contr equip & pip for highpres gates i	ls	job	17,000	7,000
Slide gates, lifts & anchor bolts, 2 f&i	ls	job	10,000	6,500
Flap gates, 2 f&i	ls	job	11,000	2,000
Fix-wh pens gt hoists i	ls	job	225,000	98,500
Radial-gate hoists i	ls	job	100,000	40,000
Radial gts & embed metwrk i	ls	job	245,000	220,500
Hollow-jet vlvs, adapters & controls, 96" 4 i	ls	job	89,800	48,000
Ring-follow gts, compl with hoists, 96" 4 i	ls	job	95,000	100,000
& fix wh gt hst contr. i	ls	job	45,000	50,000
Draft- tube blkhd gates i	ls	job	65,000	24,000
Seats & guides, stop-logs & draft-tube blkhd gts i	lb	1,005,000	0.20	0.17
Lifting frames i	ls	job	9,000	1,100
Paint & store stop logs	ls	job	16,000	12,000
Grounding system f&i	lb	30,000	3.60	3.10

(Continued on page 188)

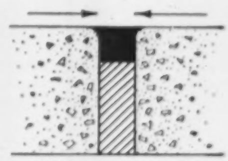
Hot Poured
Para-Plastic®
...FOR MAXIMUM JOINT PROTECTION IN CONCRETE PAVEMENT

Para-Plastic requires little or no maintenance!

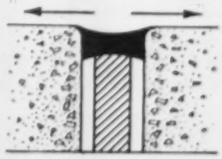
Para-Plastic is the *original* hot-poured rubberized asphalt joint sealing compound that forms a resilient, adhesive and effective seal which maintains bond at sub-zero temperatures. Para-Plastic has unique characteristics of adhesion and cohesion that make it the most efficient joint sealer available today. Unaffected by extremes of temperatures, Para-Plastic insures a moisture-tight seal of expansion, contraction and dummy joints in concrete pavement. Hot Poured Para-Plastic meets Federal Specifications SS-S-164, CAA Spec. P-605, ASTM D-1190-52T, and many State Highway Specifications.

PERFECT SEAL FOR YEARS

Drawings at right illustrate the unique characteristics of Para-Plastic Joint Sealer during extremes of temperatures. The compound remains plastic at sub-zero temperatures and changes only slightly in hardness and viscosity during higher temperatures. Servicised technicians are available to assist you in waterproofing problems and to make recommendations for installations of a specific nature. Ask for details.



Joints compressed in warm weather temperatures.



Joints opened in sub-zero temperature.

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CORPORATION
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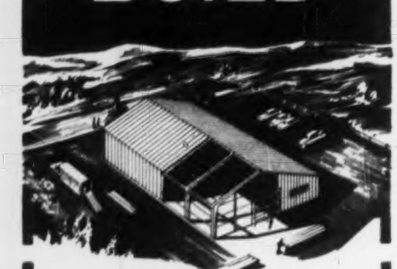
BUILD



AT LESS COST

You can save as much as $2 per square foot with Steelcraft standard steel buildings. Skillful pre-engineering cuts both labor and material costs, saving thousands of dollars over other construction methods.

FASTER

You can get fast delivery and complete erection service from your local Steelcraft steel building dealer. And, he can erect your building in only *weeks* instead of months because all parts are readily available from one source . . . all parts are predesigned for fast field assembly. Swift completion can put you in business faster . . . let you expand faster . . . meet space emergencies faster.

BETTER

Steelcraft buildings are *permanent* and provisions are "built in" for economical future expansion. You can buy to suit your exact needs . . . any width, height or length, with spans up to 80 feet . . . choice of wall and roof materials, doors, windows, skylights, insulation.

with

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Standard Steel Buildings

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describing building types, construction details, and applications

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I want to find out how to build at *less cost, faster, better.* Rush me your new catalog of STEELCRAFT STANDARD STEEL BUILDINGS.

NAME____________________

CO.____________________

ST.____________________

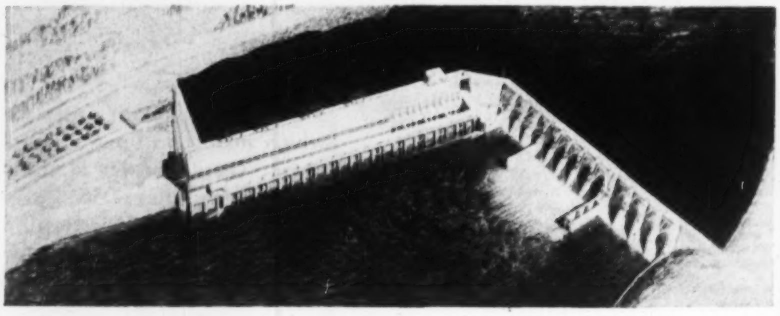
CITY__________STATE__________

. . . Glen Canyon Dam

(*Continued from page 187*)

Bids: 4-11-57 Items	Unit	Quan-tity	Unit 1C	Prices 2
Finish recess lgt units, panelbds, misc pwr brds & other elec equip	ea	180	50.00	16.00
Embed elec rigid met cond,				
½" f&i	lf	500	3.00	2.10
¾" f&i	lf	45,000	2.50	2.30
1" f&i	lf	30,000	2.75	2.70
1½" f&i	lf	17,000	3.50	3.10
2" f&i	lf	15,000	4.00	3.60
2½" f&i	lf	6,000	4.10	4.50
3" f&i	lf	12,000	5.25	5.85
3½" f&i	lf	4,000	6.50	6.80
4" f&i	lf	4,000	7.50	7.80
Boxes, #1 f&i	ea	1,200	12.00	12.00
#2 f&i	ea	1,200	13.00	13.00
Light fix, tp A f&i	ea	100	25.00	6.50
tp J i	ea	35	45.00	25.00
in rdwy parapet, dam i	ea	40	66.00	25.00
Pwr cont conduct for trav cranes PP f&i	lb	12,000	1.00	1.15
2 300-t for 75-t mach shop f&i	lb	1,500	1.00	1.30
Pwr recep outlets, compl with encl & match plugs,				
440v 100 amp f&i	ea	10	50.00	125.00
440v, 60 amp f&i	ea	75	76.00	100.00
Single thermomtrs, metrs, stress jnt & deform i	ea	516	175.00	45.00
Strain meter groups i	ea	82	350.00	360.00
Access highway				
Excavation for roadway	cy	20,500	1.25	1.75
Watering	Mgal	1,500	5.00	4.20
Rolling embankments	R.hr	160	25.00	25.00
Overhaul for roadway	micy	7,500	0.40	0.55
Spec compact, rdwy embk at bridge abut	ls	job	1,000	1,400
Excavation for roadway	cy	10	100.00	10.60
Compact backfill for rdwy structures	cy	60	8.00	8.50
Conc in bridge sidewalks	cy	17	125.00	100.00
Metal bridge railing i	lb	2,800	1.50	0.60
CMP, 24" 16 ga f&i	lf	106	10.00	12.00
Crushed rock base	t	1,065	8.00	3.50
Cover coat material	t	113	20.00	5.00
Liquid asphalt MC-2	t	4	350.00	110.00
MC-4	t	4	400.00	110.00
Guardrail, beam type f&e	lf	875	4.00	5.50
Service roads				
Excavation for roadway	cy	206,000	3.00	1.50
open cut, for rdwy tun approaches	cy	13,200	4.00	2.20
in partial rdwy tun sect	cy	3,100	5.00	5.00
in rdwy tun & adits	cy	151,000	20.00	18.50
for rdwy in talus	cy	30,300	7.00	2.00
Watering	Mgal	320	6.00	6.00
Rolling embankments	R.hr	34	15.00	25.00
Exc for roadway struct	cy	800	7.00	7.50
compact backfill	cy	330	3.00	9.00
Perm struct-steel suppts, rdwy tun & adits f&p	lb	340,000	0.40	0.26
Perm timber lag & structs, rdwy tun f&p	Mbm	30	500.00	300.00
Roadway tun roof suppt, bolts f&i	lf	6,400	7.00	2.95
Chain-link fabric f&i	sy	2,200	6.00	2.70
CMP 16 ga 12" f&i	lf	135	7.00	7.00
15" f&i	lf	32	8.00	8.00
18" f&i	lf	800	10.00	9.00
24" f&i	lf	390	13.00	10.00
12 ga 30" f&i	lf	470	15.00	16.00
48" f&i	lf	40	28.00	25.00
Conc, service bridge abut	cy	110	100.00	65.00
in service bridge decks	cy	310	90.00	120.00
in rdwy tun portals	cy	400	75.00	126.00
in drop inlets & MH for rdwy	cy	10	200.00	320.00
Drill holes, anch & grtg bars ip	lf	200	5.00	3.00
Stl struct for serv brdgs e	lf	550,000	0.11	0.05
Misc metwrk, service bridges f&i	lb	1,500	1.00	1.10
Guardrail, beam type f&e	lf	2,170	4.00	5.50
Crushed-rock base	t	15,200	5.00	3.50
Cover-coat material	t	2,100	8.00	5.00
Liquid asphalt MC-2	t	80	300.00	90.00
MC-4	t	70	140.00	90.00

Completion Time:	Days	Liquidated Damages
Power Plant	1,760	$1,000 per day
Dirt Fill, Bridge Abut	60	100 per day
Dam Proper, & Other	2,500	2,000 per day



River Diversion Plan Tips Scales On Rocky Reach Dam Bids in Washington

The contractor's own plan for controlling the strong, swift flow of the Columbia River with one final stage cofferdam took the contract for Rocky Reach Dam away from the low bidder under the engineers' conservative 3-stage scheme. The contractors used a model to prove that their plan works. Rocky Reach Builders, already on the job with the $12 million contract for the first stage, added Guy F. Atkinson Co. to their 4-company joint venture to go after this $52,413,078 final stage contract. Rejected bids at an earlier letting included a low of $58.6 million against the engineers' estimate of $55.3 million. On the second call for bids the engineers raised their estimate some and PUD added a contingency fund to total $61.3 to comply with legal requirements that the contract cannot exceed the estimate and to prevent a full year's delay should the new bids overrun the estimate. Stone & Webster Engineering Corp., Seattle, is the engineer for design and to supervise construction for Public Utility District No. 1 of Chelan County, Wenatchee, Wash.

The site is seven miles north of Wenatchee. The dam is an "L" shaped, gravity structure of mass and reinforced concrete. The powerhouse is on the Chelan County side of the "L" and the spillway angles across from the center of the channel to the Douglas County shore. It is 2,820 ft long including a 1,100 ft. powerhouse intake section. The powerhouse deck averages 104 ft to tailwater. The spillway section averages 127 ft above bedrock. The spillway is 750 ft long and has twelve 58x50 ft tainter-type crestgates, claimed to be the largest of their type in the world. Discharge capacity, including flow through turbines is 1.2 million cfs. The dam will back up a 9,080 acre reservoir, 43 miles long.

Electric output will be 710,000 kw now from seven generating units with an ultimate capability of 1,116,000 kw from 11 generators. Generators are vertical shaft type to turn at 90 rpm, rated at 101,500 kw at 95% power factor.

The turbines are Kaplan adjustable blade propellor units rated at 101,500 hp each.

The overall cost including acquisition of flooded lands, financing, relocating 23 miles of railroad and miles of highways, roads, and existing power lines is estimated at $250 million.

Completion date is set at late 1962 for the basic dam, powerhouse and initial generator units.

The final stage work force is expected to vary from 400-700 up to a peak of 1,300 in 1960. Prevailing wages include: carpenters and electricians $3.375, tractor operators $3.30 and laborers $2.51 including health and welfare benefits.

The fish ladder design is unique in that only one will be built but it will have three points of entry—at the downstream end of the powerhouse and at either end of the dam. Fish entering at the east end will go through a 600 ft tunnel within the dam to the common fish ladder on the other side of the river.

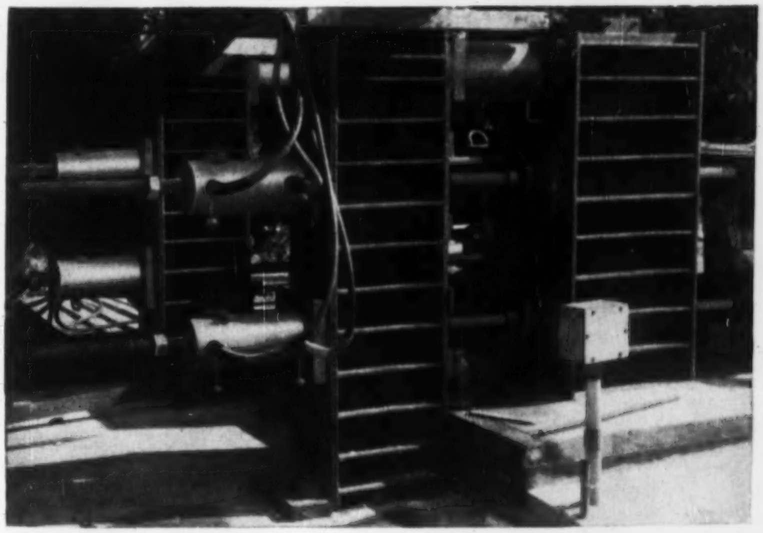
The owner will furnish major equipment that is to be installed by the contractor.

Separate contracts include:

Final stage construction, unit prices shown in following report include 750,000 cy concrete, 550,000 cy rock excavation	$52,413,078
1st stage, cofferdam, left abutment, spillway dam in all about 210,000 cy of concrete	12,048,091
7 107,000 kva generators & voltage regulators	16,020,000
7 turbine units and associated equipment	11,660,975
7 main 120,000 kva transformers	2,370,243
6 15 kv circuit breakers	359,950
15 kv bus ducts	571,848
11 230 kv outdoor oil circuit breakers	831,800
230 kv switchyard equipment and structure	361,000
Final stage electrical contract	2,552,578
Station service switchgear transformers, bus duct motor operated sluice gates	bids 9-27
Steel, struct framing for powerhouse furn, fab & del	251,056
piling, sheet, new or used, 3000 t	139,440
new 9000 t	1,026,000
floating caisson, 60x70 ft with operating equipment	195,062
12 tainter spillway gates with guides, anchorages, hoists and sills	3,029,112
2 fixed gate hoists, 25-t, for spillway	58,086
12 draft tube gates, 1 gate lifting beam and 11 sets of gate guide and bearing frame assemblies	404,682
9 intake gates, 24x50 ft	1,992,330
84 intake trash racks and related guides. Trash rake guides at 33 upstream and 33 downstream gate slots	405,134
Trash racks with guides	415,957
Gantry crane, draft tube deck, 80-t	152,000
intake deck, 150-t	234,487
2 traveling powerhouse cranes	498,000
5 jet pumps for fishway, 625 cfs	418,750

(Continued on page 190)

How to Simplify Rigging for Concrete Tensioning Beds



This concrete prestressing bed is equipped with four "Re-Mo-Trol" 100-ton center-hole hydraulic rams operated by an electric pump at 10,000 P.S.I. The rams are mounted on steel frames to which the wire strands are anchored. Note pull-rods through Center-Holes of rams. Holding tension on rods by means of lock nuts at end of ram travel permits resetting for additional "bites". . . permits unlimited travel range. *(Photo courtesy of Goodstone Mfg. Co., Inc., Rochester, N.Y.)*

Simplex Hydraulic Pullers Provide Portability and Unlimited Travel; Make Load Spacing and Balancing Easy

Pre-tensioning and post-tensioning concrete is simple and efficient with Simplex Hydraulic Pullers. Simplex Center-Hole construction permits power to be applied in *direct-line* pull through a ram to eliminate eccentric loading. At the same time, rigging is simple and economical because complicated back-up devices are not needed.

LOCKING PULL-RODS PROVIDE UNLIMITED TRAVEL

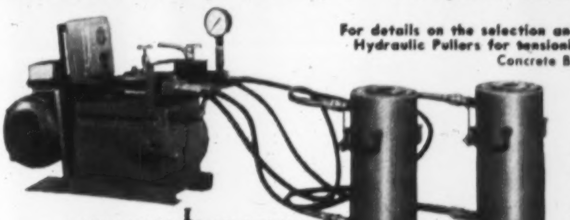
With the Simplex System, pull-rods go through the Center-Hole of the Puller and are attached to the pulling tangent holding the wire strands. The puller, braced against a stationary mount, moves the rods and tangent forward with direct, uniform pull. Unlimited travel may be obtained by locking the threaded pull-rods in tension with a lock nut after the full stroke of the ram is completed. The ram is then reset for another "bite". The procedure may be repeated as often as necessary, limited only by the length of pull-rods used.

LIGHT WEIGHT UNITS ARE EASY TO MOVE AND PLACE

Two or more pullers may be mounted to handle any installation for the production of Double-Tee, Slab or Channel members in permanent beds or at the job site. The relatively light weight of Simplex units permits easy movement from one bed to another and easy alignment for proper spacing. This provides self-equalizing, uniformly balanced pulling of either single or multiple strands or cables.

Simplex "Re-Mo-Trol" units consist of High-Pressure Rams actuated by hand, air, electric or gasoline powered pumps. Standard rams with 10" stroke are available in 60 and 100 ton models and with 22" stroke in a 100 ton model. Special units are available up to 600 ton capacity.

For details on the selection and application of Simplex Hydraulic Pullers for tensioning concrete, write for Concrete Bulletin



2 100-ton Simplex "Re-Mo-Trol" Center-Hole Hydraulic Rams actuated with Electric Powered Pump. Note 2 Shut-off Valves for manually controlling even travel of the 2 Rams.

WORLD'S LARGEST MFGRS OF INDUSTRIAL
MECHANICAL AND HYDRAULIC JACKS
SIMPLEX
RE-MO-TROL UTIL-A-TOOL JACKS JENNY SOL-TOE

TEMPLETON, KENLY & CO.
2553 Gardner Road • Broadview, Ill.

Powerful small diameter vibrators

for prestressed concrete

TO SOLVE the problem of consolidating low slump concrete in narrow, constricted areas, Viber offers these powerful, small diameter vibrators.

In addition to outstanding performance, they combine lightweight and compact design, making them remarkably easy for operation by one man.

Model 11A, weighing only 17 pounds, is amazingly effective for a unit of such small diameter. It is ideal for slip-form work and indispensable for use in constricted areas where standard vibrators are impractical.

Model 26, a full-powered small diameter vibrator is available with extended lengths of flexible drive. Head is interchangeable with Model 11A. It is especially popular in prestress manufacture because the small diameter head operates with great effectiveness in constricted, hard-to-reach places. Equipped with 4 feet of drive it weighs 37 pounds.

Tip of vibrator housing is replaceable. Viber's patented rubber tip furnished unless steel specified.

Contact your nearest dealer or write direct for further information and prices.

VIBER COMPANY, 726 South Flower Street,
Burbank 14, California

VIBER
CO

VIBRATORS

Pioneers and leaders in the manufacture of vibrators.

. . . Rocky Reach Dam

(Continued from page 189)

The bidding for construction of the final stage of Rocky Reach Dam produced the following unit prices, including those for installing, erecting, handling materials and equipment furnished by the owners. All other prices are for furnishing and placing by the contractor:

Rocky Reach Builders, Wenatchee, Wash. L. E. Dixon Co., American Pipe & Const. Co., The Arundel Corp., Guy F. Atkinson Co., The Hunkin-Conkey Const. Co.	Alt 1C	$52,413,078
	Engr. 2	55,004,824
Merritt-Chapman & Scott Corp., N. Y.	Engr. 1	54,208,000
	Alt. 2	53,641,000
Morrison-Knudsen Co., Inc., Henry J. Kaiser Co., Peter Kiewit Sons' Co., Perini Corp., F. & S. Contr. Co., Boise, Idaho	Engr. 3	55,668,710
	Alt. 3	54,768,885

Bids: 7-23-57 Items	Unit	Quantity	Unit Prices Engr. 1	Alt 1C
Ventil air cond equip	ls	job	$500,000	$368,602
for add'l	t		1,000	1,000
for reduction	t		100	100
Plumb & relat equip	ls	job	200,000	195,000
Transf water spray & CO_2 fire protect equip	ls	job	120,000	105,000
Yard well water fire protect & sewers	ls	job	60,000	72,500
Culvert pipe, 84"	lf	300	75.00	50.00
84"	lf	100	50.00	40.00
Building service equip, East Bank relay house				
4" VT sump pump disch line	ls	job	10,000	16,000
4" VT san sewer				
3" CI service water line				
General piping access equip	ls	job	1,200,000	1,140,000
Div river, Engr plan excl earthwork, Zone I	ls	job	1,827,325	1,684,840
Zone II	ls	job	1,250,000	1,684,840
Zone III	ls	job	650,000	421,210
Zone IV	ls	job	800,000	421,210
earthwork, Zone I	ls	job	1,700,000	1,615,640
Zone II	ls	job	1,250,000	1,615,640
Zone III	ls	job	120,000	403,910
Zone IV	ls	job	100,000	403,910
bidder's alternative, except earthwork A	ls	job	4,227,325	3,212,103
earthwork A	ls	job	2,907,000	2,458,351
Unload, haul & store sheet piling, Zena	t	2,500	10.00	5.20
Excavation common, Zone I	cy	92,000	1.75	1.80
Zone II	cy	28,000	1.75	1.80
Zone III	cy	18,000	2.00	1.80
Zone IV	cy	20,000	3.00	1.80
outside Zone I-IV	cy	9,000	3.00	1.80
rock, Zone I	cy	227,000	5.00	5.00
Zone I	cy	23,000	1.80	1.80
Zone II	cy	85,000	5.50	5.00
Zone II	cy	11,000	2.25	1.80
Zone III	cy	78,000	5.50	5.00
Zone III	cy	7,000	2.25	1.80
Zone IV	cy	60,000	6.00	5.00
Zone IV	cy	4,000	2.50	1.80
outside Zone I-IV	cy	5,000	8.00	5.00
Prep rock fnd surf for conc	sy	50,000	6.00	8.00
	sy	10,000	4.50	4.00
Rock fill, dumped	cy	75,000	1.00	1.75
Riprap	cy	10,000	3.00	2.00
dumped	cy	10,000	1.25	1.25
Drill BX holes & recov core, 2⅜"	lf	3,000	9.00	7.50
Grout holes, drill 0-30' diamond rot bit, 1½"	lf	3,800	4.00	3.30
percussion drill, 1½"	lf	800	3.50	2.80
extend 30-75' diamond rot bit, 1½"	lf	2,330	4.00	3.30
75-250'	lf	400	5.00	3.80
Pressure grouting	cf	10,000	5.00	4.00
Service grout crew & equip	cr/hr	2,500	25.00	25.00
gr hole pipe & drain hole pipe connections	lb	5,800	2.00	0.60
Drill fnd drain holes, 3", percus drill	lf	9,300	4.00	3.30
rot diam bit	lf	2,000	8.00	7.00
Conc drains, half round 24"	lf	2,400	6.00	6.00
Steel pipe drains 6"	lf	2,800	5.00	5.00
Sewer pipe drains 8"	lf	1,000	4.00	3.00
12"	lf	1,000	6.00	5.50
CMP culverts, 12"	lf	1,000	7.00	7.00
24"	lf	1,000	12.00	12.00
Gates with guides, regulating	ea	6	9,000	5,500
rotary, & oper mech	ea	2	12,000	12,500
orifice	ls	job	130,000	185,000
Traveling crane & access struct steel incl 2 lift beams	ls	job	30,000	22,500
Traveling twin hoists & acces struct steel incl 1 lifting beam	ls	job	25,000	23,500

(Continued on page 195)

Despite 25-ton loads . . .

hauled over "the worst possible" terrain . . .

nylon cord tires stopped costly bruise damage

W. H. Kearney, President of Onondaga Ready-Mix, Inc., Syracuse, N. Y., reports:

"Nylon cord tires cut road delays 75%, stopped blowouts completely"

"Before we switched our 20 cement trucks to nylon cords 3 years ago," writes Mr. Kearney, "our tires were breaking down under the terrific mauling from sharp rocks, metal stakes, and 25-ton loads. Blowouts due to bruise damage and water rot of tire cord were all too frequent. Nylon stopped these failures completely; road delays are down 75%. We're now able to get up to three times as many recaps, to add about 80% to original tread mileage. We're expecting as much as 60,000 miles on some tires. You can bet that every one of our replacement tires is nylon."

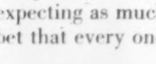
PROVE TO YOURSELF that nylon cord truck tires give more mileage, more retreads, at the lowest cost per mile. Ask your dealer about nylon cord truck tires today. (Du Pont makes the tough nylon yarns, does not produce tires.)

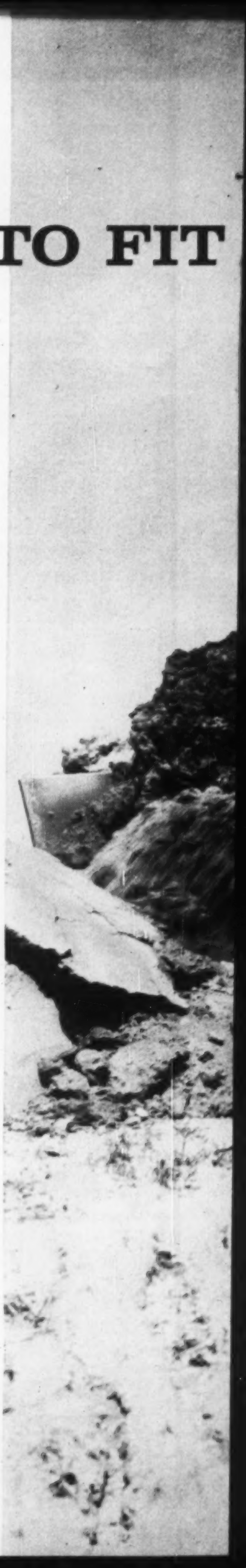
Du Pont nylon for tire cord

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*


For trucks and passenger cars, too . . . the strongest, safest tires are made with nylon cord



here's the NEW HD-21...

DESIGNED AND BUILT TO FIT

Now . . . major advances make the Allis-Chalmers HD-21 more productive than ever . . . capable of handling big-tractor jobs of every kind with the efficiency and dependability all contractors want and need.

New 225-net-hp turbo-engine

New weight—45,500 lb (bare)

New power train and torque converter effectiveness, simplicity

New longer track for matched traction, flotation

New operating ease and control with work-saving decelerator

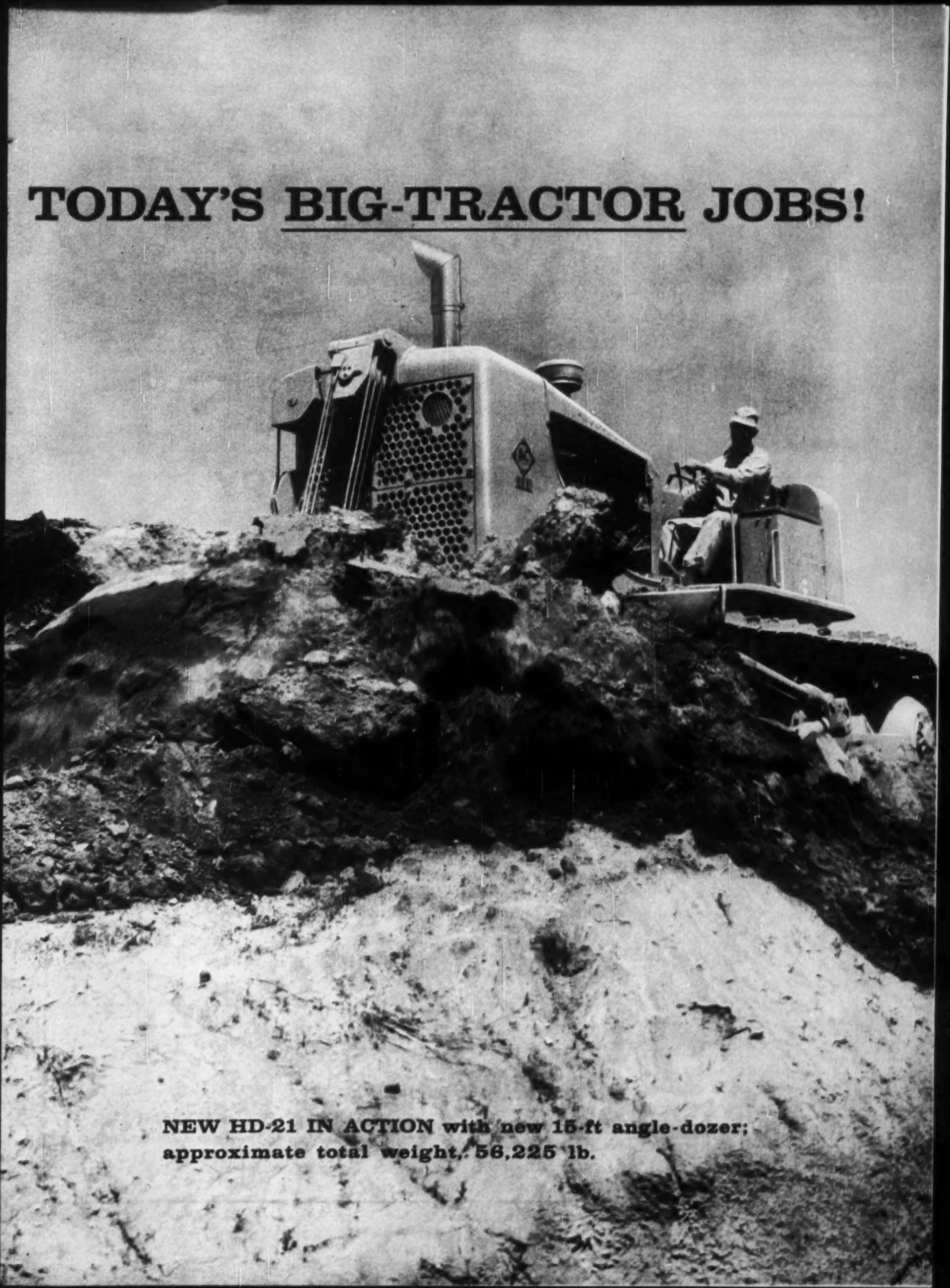
New heavy-duty matched dozers

Here's a big tractor you can depend on to help you bid with confidence in your cost estimates. Your Allis-Chalmers dealer will be glad to talk to you about the new "21" . . . and to prove its value in a working demonstration on your job. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

TODAY'S BIG-TRACTOR JOBS!



NEW HD-21 IN ACTION with new 15-ft angle-dozer; approximate total weight, 56,225 lb.

Write for a better way to bag new business

If you're gunning for more business from new construction, Dodge Reports can help improve your aim. They point out your *live* prospects . . . put an end to the hit-or-miss method of finding business. If you would like to see how Dodge Reports can build your business . . . help your profits mount, just read this coupon, and mail it today!

TO: **DODGE REPORTS,** DEPT. 108, 119 WEST 40th STREET, NEW YORK 18, N. Y.

Yes! I'd like to see how to get more business by knowing in advance who's going to build, what, when, where.

I want to know whom to contact and when to submit bids.

I'd like to see some Dodge Reports, and I'd like a copy of your booklet that tells how to use this accurate, daily, up-to-the-minute construction news service.

I understand that I can pick just the area in the 37 Eastern States and the type of construction activity that interests me. Also, that I won't have to wade through mounds of data to find the information I need.

I'm interested in General Building ☐ House Construction ☐ Engineering (Heavy Construction) ☐

In the Following Area:____________________

NAME____________________

ADDRESS____________________

CITY____________ZONE______STATE______

F. W. DODGE CORPORATION

Dodge Reports

For Timed Selling to the Construction Industry

. . . Rocky Reach Dam

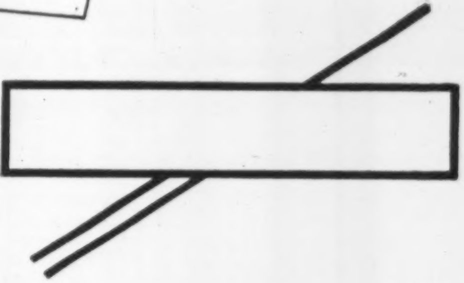
(Continued from page 190)

Bids: Items	Unit	Quantity	Unit Prices	
			Engr. 1	Alt 1C
Derrick hoist with lifting chains	ls	job	10,000	8,000
Fixed hoists	ea	20	6,000	4,650
Sluice gates with motor oper gate stands for fish collect & transp channels	ea	122	5,000	4,600
for turbine pump intakes	ea	2	9,000	9,550
Traveling water screens	ea	4	25,000	28,500
Wing gates with motorized gate stands	pr	31	13,000	11,000
Float controlled motor oper gate	ls	job	15,000	10,000
Trash racks for fishway	ls	job	130,000	122,500
Stop logs, guides & lifting beams for fishway	ls	job	375,000	295,000
Fish counting station	ls	job	16,000	15,000
Corrosion resist steel grating & acces for diffusion chamber openings	ls	job	275,000	211,000
Walkway, grating & struct steel supports	ls	job	150,000	144,200
CMP & access CP for passing migrant fish, 42"	ls	job	12,000	10,250
Turbine pumps for fishway i	ea	3	20,000	35,000
Misc items for future fishway pumps i	lb	100,000	0.15	0.08
Tainter gates guides & hoists, exc trunnion girders & anchor i	ea	12	35,000	23,597
Trunnion girders for tainter gates & anchor i	t	750	300.00	100.00
Field test & instal spillway caisson e	t	290	300.00	250.00
Intake gates & movable access i	ea	9	10,000	11,000
Trash racks i	ls	job	50,000	80,000
Draft tube gates & movable acces i	ea	12	5,000	4,250
Gantry crane 150 t e	ls	job	50,000	51,000
80 t e	ls	job	30,000	18,500
Bridge cranes & elec bay crane, 250 t e	ls	job	75,000	70,000
Turbines, governors & acces i	ea	7	75,000	105,000
Unload mech equip	t	17,000	14.00	9.50
Misc equip i	t	100	400.00	334.00
Guides & anchors, intake & draft tube gates & trash racks i	t	2,883	200.00	220.00
Railroad track f&c	ly	500	80.00	86.00
Stop logs for intake of future generating units	ea un	4	75,000	85,500
Conc porous bed for drains	cy	130	20.00	20.00
forebay wall	cy	41,000	11.00	13.55
forebay wall	cy	1,000	4.00	5.00
Conc pwrhouse int, Zn I	cy	18,000	18.00	13.55
I	cy	4,000	4.50	5.00
II	cy	9,000	15.00	13.55
II	cy	1,000	4.50	5.00
III	cy	11,000	15.00	13.55
III	cy	1,000	4.50	5.00
IV	cy	10,000	15.00	13.55
IV	cy	1,000	4.50	5.00
Conc pwrhse substr, Zn I	cy	137,000	13.00	14.85
I	cy	12,000	4.20	5.90
II	cy	50,000	13.00	14.85
II	cy	5,000	4.50	5.90
III	cy	76,000	13.00	14.85
III	cy	7,000	4.50	5.90
IV	cy	50,000	15.00	14.85
IV	cy	4,000	5.00	5.90
Conc superstructure	cy	52,600	20.00	18.00
superstructure	cy	3,000	5.30	7.15
center nonoverflow dam	cy	74,500	14.00	13.80
center nonoverflow dam	cy	500	4.50	5.00
spillway dam	cy	98,000	14.00	14.00
spillway dam	cy	2,000	8.00	5.00
spillway deck	cy	1,000	40.00	25.00
in fishway	cy	16,000	40.00	20.00
in fishway	cy	9,000	5.75	7.00
Concrete precast	cy	360	120.00	67.00
wear crses on roofs	sf	20,000	0.75	0.60
stairs	cy	200	50.00	55.00
parapets & curbs	cy	550	50.00	40.00
blockouts	cy	2,100	75.00	75.00
misc	cy	3,500	35.00	21.00
Cement, type I f	bbl	1,800	6.50	5.25
type I f	bbl	200	5.50	5.00
type II, low alkali f	bbl	346,000	6.00	5.25
type II, low alkali f	bbl	14,000	5.20	5.00
type III f	bbl	2,700	6.50	6.00
type III f	bbl	300	5.75	5.50
std type II f	bbl	354,000	5.50	5.00
std type II f	bbl	14,000	5.00	4.60
Monolithic finish f&c	sy	50,000	2.00	0.50
Monolithic-granolithic finish f&c	sy	2,000	3.50	4.70
Granolithic finish f&c	sy	3,000	7.00	8.25
Furn matl & stoning finish	sy	1,000	5.00	7.00
Rubber water stops, tp A	lf	28,000	3.00	4.25
tp B	lf	4,000	3.50	4.75
tp C	lf	500	3.00	3.10
Expan jnts, premo bit matl	sy	1,000	10.00	12.00
cork	sy	500	10.00	9.75
fibreglas	sy	1,000	11.00	15.50
plastic seals	lf	2,500	1.50	1.70
asphalt seals	lf	2,000	2.00	4.55

(Continued on page 196)

TRICKY
TRACINGS

Question: Without the aid of a ruler, can you tell which of the bottom two diagonals is a continuation of the top one? See answer below.



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Whatever the project, you can count on Arkwright's superior working surface to produce crisp, clean drawings . . . clear in every detail . . . permanently protected against fraying, tearing, curling or discoloration. In the simple drawing above, the upper left-hand diagonal represents a continuation of the top diagonal.

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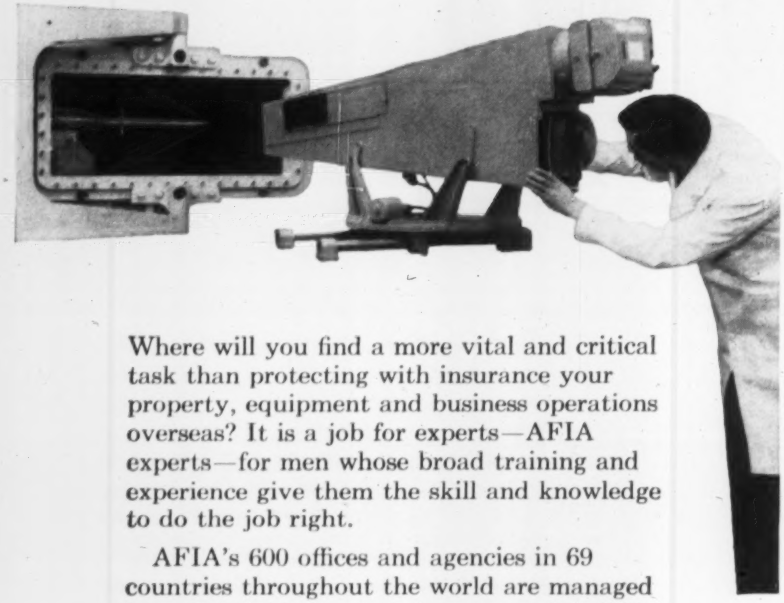

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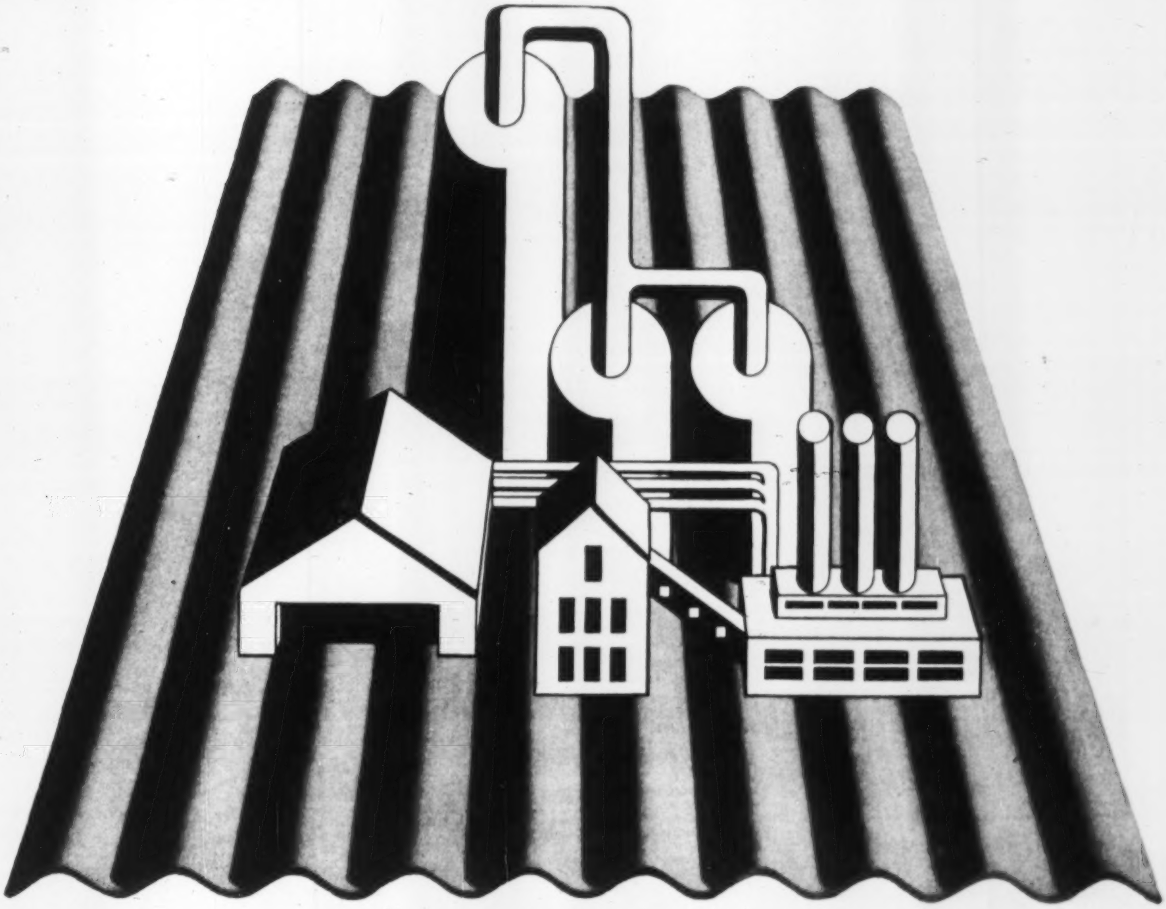
. . . Rocky Reach Dam

(*Continued from page 195*)

Bids: 7-23-57 Items	Unit	Quantity	Unit Prices Engr. 1	Unit Prices Alt 1C
Furn, pl & rem forms, & scroll cases & draft tubes, generat units	ea	7	250,000	210,000
Furn, pl & strip forms with flat surf	sf	3,100,000	2.00	2.50
	sf	400,000	1.50	1.55
curved pier nose	sf	40,000	3.00	2.50
	sf	10,000	2.00	2.00
curved surface exc curved pier nose or ogee forms	sf	150,000	3.50	3.65
	sf	40,000	2.50	3.00
Copper water stops	lf	14,000	3.00	2.80
Reinf bars and dowels	t	27,000	275.00	280.00
	t	3,000	256.00	250.00
Reinforcing mesh	t	20	600.00	575.00
Foundation dowels	lb	56,000	0.50	0.43
Dampproofing concrete	sf	4,000	0.30	0.35
Surface floor hardening	sf	55,000	0.07	0.06
Metallic floor hardener f & incorporate	sf	25,000	0.25	0.30
Anchor bolts, sleeves & misc iron set in conc	lb	200,000	0.60	0.55
Nonslip finish to conc	sf	1,000	0.60	0.70
Rem temp timb, spillway deck	Mbm	100	125.00	150.00
Misc steel	lb	1,200,000	0.50	0.35
Steel pipe handrailing	lb	60,000	0.75	0.80
Ornamental iron balusters	lf	400	20.00	21.00
Aluminum balusters & rail	lf	700	25.00	42.00
parapet wall, rail	lf	4,000	12.00	10.00
Galv steel floor grat & treads	lb	250,000	0.40	0.50
Spandrel beams f	lb	4,000	0.50	0.42
Abrasive nosings	lf	600	8.00	7.00
Met stair trds & risers	lb	15,000	0.80	0.90
Steel spiral stairs	ls	sum	20,000	30,000
hatch covers	lb	20,000	0.40	0.46
struct f	t	500	300.00	350.00
Roofing	ls	job	140,000	145,000
Steel struct e	t	2,000	120.00	125.00
Elevators	ls	job	100,000	90,000
Resil floor tile, vinyl plastic	sf	10,000	0.75	1.30
rubber	sf	5,000	0.70	1.10
tile base	lf	3,000	0.50	0.80
Mas wall tile ungla, 4"	sf	2,000	1.50	1.65
glazed, 2"	sf	22,000	1.75	2.40
4"	sf	2,500	2.50	2.75
6"	sf	7,160	3.00	3.30
Conc block partn walls, 4"	sf	3,000	1.00	1.50
walls, 8"	sf	13,500	1.20	1.70
12"	sf	4,000	1.50	2.40
Ceramic floor tile & glazed cer wall tile	ls	job	10,000	11,000
Suspended acoustic tile & luminous ceilings	ls	job	25,000	24,200
Plastered walls & ceilings	ls	job	5,000	6,500
Hollow metal doors	ls	job	9,000	9,250
Partitions wire grille	sf	10,000	2.00	2.40
movable	ls	job	20,000	29,000
metal toilet	ls	job	2,000	1,650
Steel lockers	ls	job	2,000	1,850
Doors wood	ls	job	1,000	550
rolling steel	ls	job	4,000	4,000
tinclad	ls	job	1,000	800
Metal sash & operators	ls	job	20,000	23,500
Glass & glazing	ls	job	30,000	28,500
Ch link fence & gates	lf	3,500	6.00	6.00
Terrazzo floor	sf	85,000	1.75	2.30
Roads, sidewalks & parking areas	sy	36,000	3.50	3.75
Wearing course, spillway deck	sy	1,500	3.00	3.30
Metal hoods, louvers, screens & ventilators	ls	job	25,000	21,000
Woodwork & millwork	ls	job	25,000	13,500
Painting concr surf	sf	220,000	0.20	0.20
plaster surfaces	sf	11,000	0.20	0.18
struct steel	t	1,300	20.00	21.50
misc. steel	lb	450,000	0.05	0.045
interior equip	sf	100,000	0.35	0.275
exterior equip	sf	25,000	0.30	0.30
doors & frames	sf	7,500	0.50	0.27
woodwork	sf	10,000	0.20	0.40
building service instal	ls	job	50,000	40,000
exposed steel & equip	sf	400,000	0.30	0.25
surf not otherwise designated	sf	50,000	0.25	0.29
Sandblast struct steel, spillway deck & other surf	sf	25,000	0.20	0.27
Ext metal wall panels	ls	job	55,000	40,000
Cut stone int finish	sf	1,500	10.00	11.00
Manhole cov & frames	lb	7,000	0.60	0.35
Flag poles	ls	job	5,000	5,000
Watertight doors	ls	job	2,000	2,000
Elevated water tank	ls	job	45,000	43,000
Conc test lab & engrs' admin bldg	ls	job	100,000	60,000
Door hardware & cyl locks	ls	job	4,500	4,500
Soundproofing	sf	1,000	3.00	3.30
Fixtures, met partn, control rm & off	sf	2,360	4.00	2.20
Allowance for 50% performance bond				
engr plan			341,000	345,000
alt			337,400	334,000

(*Unit Prices continued on page 198*)



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Rock Fill Flood Control Dam in Vermont

The highest flood control dam in New England, Ball Mountain Dam, Jamaica, Vt. went under contract at $6,904,574 to Merritt-Chapman & Scoot Corp., East Hartford, Conn. This price is 6% under the text bid and 3% under the "profit excluded" estimate by the Boston District, Corps of Engineers.

This rock filled dam will be 885 ft long and 252 ft high. Outlet works include intake structure with circular intake tower, 20 ft ID and 205 ft high, a 13 ft 6 in. concrete lined tunnel 864 ft long through rock and three hydraulcally operated sluice gates 5 ft 8 in. by 10 ft. The spillway on right abutment has concrete weir 235 ft long, 15 ft high and 57 ft wide at base. This is part of the Connecticut River Basin Flood Control Project.

Cement content for concrete ranges from 4½ to 6½ bags per yard depending on size of aggregate.

Minimum wages include: carpenters $2.25, laborers $1.40, power equipment operators from $2.70 on pumps and compressors to $3.25 on power shovels and cranes.

The six bidders include:

1C	Merritt-Chapman & Scott Corp., East Hartford, Conn	$6,904,574
2	Perini Corp., Framington, Mass	7,364,216
6	The Hunkin-Conkey Const. Co., Cleveland, Ohio	8,585,039
EE	New England Div., Corps of Engineers, Boston, Mass. "profit excl"	7,116,126

Bids: 4-23-57 Items	Unit	Quantity	Unit Prices 1C	2
Control & diver riv	ls	job	$200,000	$106,000
Prepare site	ls	job	150,000	50,000
Repair & paint exist bridge	ls	job	50,000	50,000
Exc, com-genl				
1st 225,000 cy	cy	225,000	1.60	1.50
over 225,000 cy	cy	150,000	0.60	0.80
borrow area F.				
1st 45,000	cy	45,000	0.80	0.90
over 45,000 cy	cy	25,000	0.80	0.75
area G. 1st 40,000	cy	40,000	0.80	1.00
over 40,000 cy	cy	25,000	0.80	0.95
area J. 1st 120,000	cy	120,000	0.80	0.90
over 120,000 cy	cy	70,000	0.80	0.75
impervious borrow	cy	1,060,000	0.80	0.90
borrow area L.				
1st 40,000	cy	40,000	0.95	1.10
over 40,000 cy	cy	25,000	0.95	0.75
rock, op ct, 1st 600,000	cy	600,000	3.00	2.80
over 600,000 cy	cy	110,000	2.00	1.80
Excavation, continued				
tunnel	cy	10,000	22.00	50.00
trench, rock, to 6.0′	cy	410	8.00	12.00
over 6.0′	cy	200	10.00	15.00
structure, rock	cy	50	20.00	15.00
Line drilling	sf	3,750	2.50	3.00
Fill, impervious	cy	1,060,000	0.30	0.25
gravel	cy	295,000	0.14	0.20
addl embank roll	hrs	1,300	6.00	20.00
rock, dam	cy	945,000	0.50	0.20
road	cy	11,000	0.65	0.90
gutter	cy	180	3.00	20.00
Gravel, road	cy	2,100	3.00	4.00
backfill	cy	450	4.00	5.00
Mob & demob				
tun drill & grtg	ls	job	2,000	3,000
fndn drill & grtg	ls	job	2,500	3,000
Drill 1½" grout holes, tun	lf	750	4.50	4.00
foundation	lf	5,700	3.90	4.00
3" drain holes, tun	lf	550	5.50	5.00
open cut	lf	1,700	8.00	6.00
3" explor holes, tun	lf	100	6.00	15.00
fnds	lf	500	4.75	15.00
Sand in grout	cf	100	2.00	3.00
Portland cmt in grout	cf	850	3.00	3.00
Placg grout fnds, explor holes & collars	cf	800	3.50	5.00
contact grouting	cf	100	4.00	5.00
consolid grouting	cf	150	4.00	5.00
Connect grout holes @ $10 ea	ea	300	10.00	10.00
Anchor bars, 6′ setting	ea	70	10.00	60.00
10′	ea	200	15.00	100.00
Conc, retain wall	cy	4,600	27.50	40.00
lining	cy	1,110	40.00	50.00
int twr, below el 868	cy	5,380	30.50	60.00
el 868 to el 1037	cy	1,260	48.00	75.00
above el 1037	cy	230	110.00	110.00
tunnel lining	cy	2,300	60.00	70.00
transition	cy	910	38.00	80.00
spillway weir	cy	5,670	27.00	32.00
bridge piers & abut	cy	1,900	30.00	40.00
service bridge	cy	130	85.00	110.00
misc	cy	100	90.00	125.00
Portland cement	bbl	33,000	5.50	5.50
Steel, reinf	lb	650,000	0.14	0.15
Rubber water stop, tp A	lf	2,400	2.00	3.00
Steel, struct, bridge	ls	job	75,000	70,000
Misc metals	lb	50,000	0.75	0.75
struct steel	lb	46,000	0.65	0.75
Tunnel rib supports	ea	20	300.00	500.00
each addl one	ea	10	250.00	600.00
Rock bolting, tunnel	ea	30	50.00	25.00
open cut	ea	800	30.00	40.00
Black steel pipe	lb	6,200	0.30	0.75
Intake twr, superstruct	ls	job	10,000	10,000
Air vent system	ls	job	$34,000	$50,000
Float well & access	ls	job	6,950	12,000
Elevator	ls	job	23,000	25,000
Hydr gates & access & gates hydr sys	ls	job	250,000	350,000
Trolley hoist, 10 t	ls	job	10,500	18,000
Sump pump & access	ls	job	500	1,400
Heat & ventg sys	ls	job	5,000	5,000
Diesel-elec gen set	ls	job	10,500	15,000
Elec work, interior	ls	job	12,000	53,000
exterior	ls	job	22,500	26,000
Tile gages	ls	job	2,500	6,000
Flag pole	ls	job	1,000	2,000
Perf asph ctd cgmp underdrain, 6"	lf	660	2.50	6.00
Observation risers	ea	2	100.00	50.00
RCCP 15"	lf	30	5.00	10.00
30"	lf	70	10.00	15.00
Bit conc road surf	sy	4,230	2.20	3.00
Guard rail, plank	lf	48	6.00	7.00
two-cable	ls	job	3,910	8,000
Cement rubble masonry	cy	30	30.00	125.00
Log boom	ls	job	3,500	7,000
Safety mesh	sy	22,000	1.35	3.00
Chain link fence	lf	170	6.00	6.00

Completion Schedule: 1,340 calendar days

Oregon Flood Control Dam and Power Works

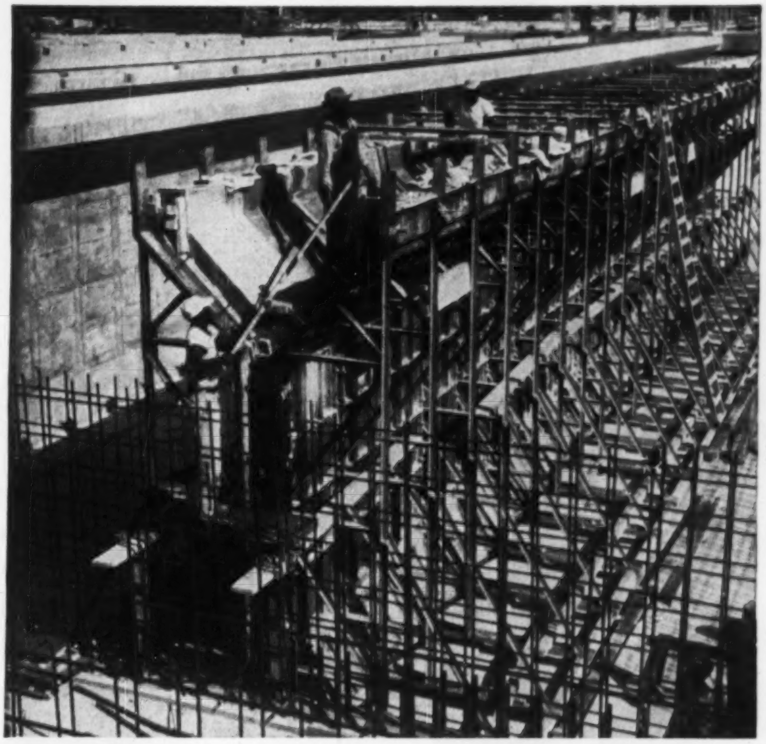
Construction of earth embankment, spillway, intake tower, regulating outlet, penstock and detour roads and bridges at Hills Creek Reservoir on Middle Fork Willamette River, Ore., for the U. S. Army Corps of Engineers, Portland District, drew five bids. The low bid of $20,572,366 by Green Construction Co., Des Moines, Ia. and Tecon Corp., Dallas, Tex., tops the government estimate, profit not included, by 22.7%. But it is 4.9% under the second low bid and 17.2% below the high bid.

This project will be operated as a unit with Lookout Point Dam 26.5 miles downstream for flood control and power generation.

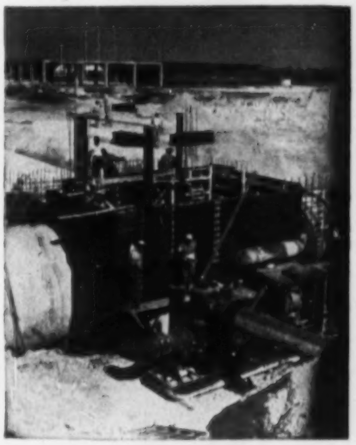
The Hills Creek Dam is an earth and gravel fill type embankment, 1920 ft long with a maximum height of 338 ft from foundation to crest and a powerhouse with installed generating capacity of 30,000 kilowatts.

A gated chute-type spillway and a tunnel outlet will be provided in the right abutment. The reservoir will provide

(*Continued on page 201*)



Special Y wall forming system makes for simplified stripping operation. 100% reusability of all materials. Note complete absence of lumber normally required for shoring and bracing on this type of structure.



Intricate forming in restricted areas presented no problem. Uni-Form Panels erected aligned and braced one side eliminated difficulties normally encountered in placement of reinforcing steel. Note Uni-Form Panels around large precast pipe.

One side aligning and bracing provides clear unobstructed working areas increasing job efficiency.

CUTS MATERIAL COSTS with

Pre-Fab Form System on Sewage Plant Job

In the construction of the Miami Sewage Treatment Plant Job the Paul Smith Construction Co., of Miami, Florida chose to use the Uni-Form Panel System in the forming of one million sq. ft. of contact area. The contractor estimated that the use of the Uni-Form System *saved 40 percent in material costs alone.* In addition, faster form erection with fewer men kept the job moving ahead of schedule and reduced estimated labor costs considerably. These fine results were obtained even though this was the contractor's first experience with the Uni-Form Panel System.

This considerable savings in material and labor was realized in spite of intricate Y wall forming and pipe intersections which causes complicated forming problems with conventional forming systems.

Pre-fabricated, ready to use—completely engineered to handle most forming problems, the Uni-Form Panel System provides such advantages as simple assembly—minimum one side alignment and bracing—automatically accurate wall widths—positive internal spreading—faster stripping and maximum re-usage to give the contractor lowest all around form costs.

Y wall trusses designed to member with standard Uni-Form Panels formed a completely automatic system for handling the special forming problems, and were big factors in the economy and speed obtained on the job. Simple assembly of Standard Uni-Form Panels on the trusses eliminated many of the aligning, bracing and spreading problems usually encountered in Y wall construction. In addition to simplified forming the combination system of standard Uni-Form Panels and trusses eliminated many of the problems normally encountered in the stripping of a wall section of this type. The contractor was well pleased with all phases of his forming and stripping operations.

Why not investigate the many advantages the Uni-Form Panel System can bring to you? Write for the Uni-Form Catalog — or better yet, send us a set of plans for an estimate on your next job. Let us prove to you as we did to the Paul Smith Construction Co., that the Uni-Form Panel System can cut your forming costs.

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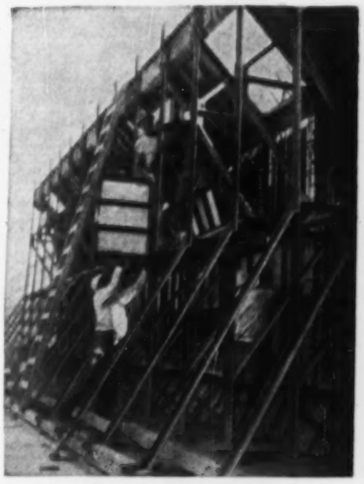

Y wall trusses incorporated alignment, bracing, shoring and scaffolding requirements.

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Services related to a product are generally just as important as the product itself. That's particularly true in the selection of windows or curtain-wall systems. And it is why the complete engineering and consulting service rendered by Bayley so frequently results in Bayley Windows and Curtain-Wall Systems being specified on important projects.

When their products are to be used, Bayley feels a responsibility from the project's inception to the building's occupancy . . . endeavoring to lend every possible assistance in creating an attractive building of permanence at the lowest cost. 77 years of progressive development of many of the most important window advancements qualifies Bayley Engineers for rendering you this specialized assistance.

Call your local Bayley Representative. He'll be glad to put Bayley experience to work for you.

Be sure to see Bayley's three catalogs in Sweet's Architectural File: Curtain-Wall Systems 3d/Ba; Steel Windows 17b/Ba; Aluminum Windows 17a/Bay; or write for copies!

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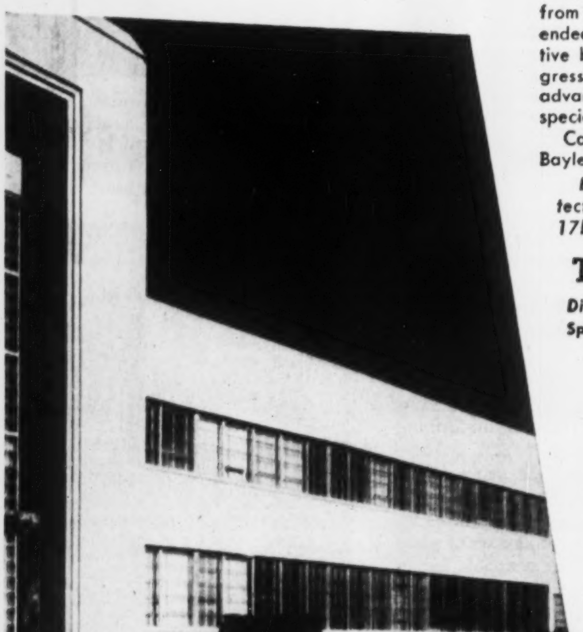

WAREHOUSES

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ORIGINATORS • DESIGNERS • MANUFACTURERS • INSTALLERS

. . . Oregon Flood Control

(Continued from page 198)

249,000 acre-feet of usable storage, 200,000 af for flood regulation and multi-purpose use and 49,000 af exclusively for power production.

Excavation accounts for 28.9% of contract price; compacted fill, backfill, and rock fill for 37.6% and concrete for 8.4%.

The unit price by the low bidder for rock excavation of $5.00 per cu yd is 81.8% above the government estimate of $2.75 per cu yd but for compacted gravel fill $0.49 per cu yd is 30.5% below the government estimate of $0.705 per cu yd. However, total costs for the two items are comparable.

Lump sum bid for diversion and care of water is $280,000 by the low bidder, compared with $2,654,565 by the second bidder. This wide difference accounts in large measure for the overall difference in the two bids.

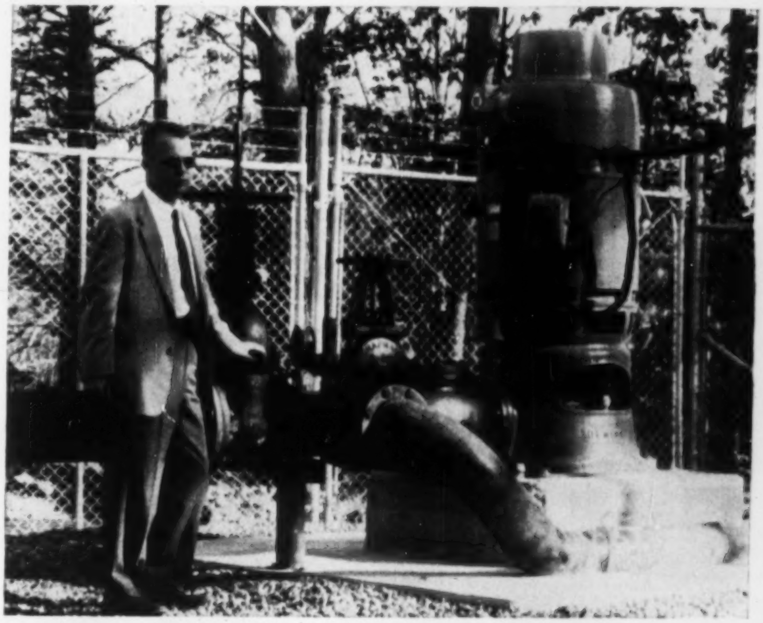
Minimum wage rates include: general laborers $2.35, pipe layers, form strippers, jackhammer operators $2.55, tractor operators with scraper $2.72 to $2.85, dump truck drivers from $2.50 to $3 (over 30 yd), power shovel & crane operators $2.90 to $3.38, electricians $3.15, carpenters $2.90.

The five bidders include:

1C	Green Constr. Co., Des Moines, Ia., & Tecon Corp., Dallas, Tex	$20,572,366
2	Guy F. Atkinson Co., So. San Francisco, Calif. & Ostrander Constr. Co., Portland, Ore	21,625,448
5	Morrison Knudsen Co., Inc., Seattle, Wash.	24,842,727
EE	U S Army Engr Dist., Portland, Oregon	16,770,500

Bids: 5-28-57 Awd 6-27-57		Quan-	*Unit Prices	
Items	Unit	tity	1C	2
Divr tunnel stoplogs ip	ls	job	$20,000	$40,000
Concrete tunnel plug	ls	job	75,000	88,000
Diversion & care of water	ls	job	280,000	2,654,565
Exc, common, waste	cy	952,000	0.84	0.88
rock	cy	919,000	5.00	2.93
tunnel	cy	11,000	50.00	46.20
Strip, govt quarry	cy	70,000	0.70	0.69
Waste, govt quarry	cy	50,000	1.10	1.40
Drill install rock bolts	lf	22,000	3.00	2.50
Steel struct in tunnel	lb	24,000	0.30	0.35
rib set f	Set	17	175.00	150.00
i	Set	17	175.00	250.00
Drainage tunnel	lf	415	360.00	160.00
Three drilling rooms	ls	job	54,000	35,000
Timber bulkheads	lf	1,000	12.00	12.50
Chain link wire mesh	sf	150,000	0.18	0.34
Compact fill, imperv zone	cy	1,200,000	1.55	1.40
blanket	cy	170,000	1.30	0.50
gravel zone	cy	8,106,000	0.49	0.65
Backfill, impervious	cy	100	9.20	10.00
gravel	cy	5,000	4.50	3.00
Rock fill	cy	530,000	2.26	1.60
place random	cy	925,000	0.49	0.165
Gravel bedding	cy	4,000	3.50	5.50
Dumped stone revetment	cy	70,000	3.90	4.25
Addl rolling for compaction	hr	500	15.00	20.00
Mobil & demobil drill grout equip	ls	job	1,650	1,000
Drill EX curtn grt hole	lf	7,000	3.25	2.40
EX ring grt hole	lf	1,500	3.50	3.60
NX drain hole	lf	1,150	5.80	5.10
percus drn holes 2¾"	lf	5,700	2.00	3.35
NX explor hole	lf	500	9.00	8.60
BX explor hole	lf	500	8.40	7.60
Min pay curtain grt conn	ea	40	5.00	5.00
ring grout conn	ea	20	5.00	5.00
Conc, spillway	cy	18,500	28.00	30.00
bridges	cy	400	170.00	138.00
tunnels	cy	4,250	50.00	68.00
intake tower	cy	11,000	42.00	56.00
chan & culv	cy	14,000	32.50	42.00
slab ct-off trnch	cy	400	30.50	65.00
formd, imp fdn	cy	100	80.00	70.00
Mort jts & crks, imp fdn	cy	50	50.00	95.00
Conc drain pipe 6"	lf	100	3.00	3.50
12"	lf	480	4.00	14.00
Portland cement	bbl	59,000	5.60	5.50
Steel, reinf	lb	1,730,000	0.14	0.17

(Continued on page 205)



This Deming 4700 Vertical Turbine Pump discharges 1600 gallons of water per minute!

HOW LOW COST WATER

CAN ADD TO PLANT PROFIT

High cost water can be an important factor in plant operating costs . . . knowing this, one eastern paper manufacturer checked into possible savings that might result from establishing and operating his own water supply.

First—A Deming distributor was consulted. Sydnor Pump and Well Co., Richmond, Virginia, made a preliminary survey of the ground water characteristics of the area.

Second—A test well was drilled to obtain complete geographical data.

Third—After studying survey results and geological data, a well 16 inches in diameter, 750 feet deep was drilled. A Deming 4700 Vertical Turbine Pump, water-lubricated type, was installed with a setting of 250 feet. The pump discharges approximately 1600 gallons per minute.

"We selected this Deming Turbine Pump for its water-lubricated design and semi-open, easily-adjustable impellers," said Mr. H. C. Berkely of Sydnor Pump and Well Co.

A Factory-Owned Water Works

This installation by an experienced Deming distributor meets the customer's present volume needs for pure water and provides for increased volume needs at lower cost.

For specific data on Deming Vertical Turbine Pumps, write for free BULLETIN 4700-A.

THE DEMING COMPANY— 536 Broadway - Salem, Ohio

DEMING

INDUSTRIAL PUMPS

Takes the tough jobs.

NEW MAGNETIC DRILL PRESS
with HYDRA-POWER FEED
precise and remote control

..standing on its head!

Mail coupon below for free demonstration of NEW Black & Decker Magnetic Drill Press!

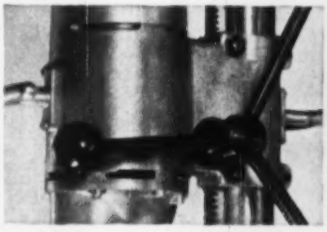
Stable, one-piece power unit, built-in drill point locator insure finest precision!

The new B&D Magnetic Drill Press is so loaded with user-wanted features—that it just has to be seen to be appreciated. To see it at work on your own application, mail coupon below for a free demonstration.

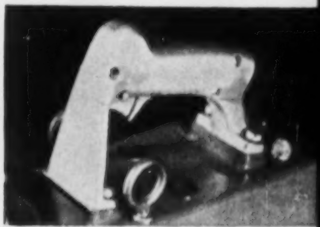
For instance: Its exclusive two-piece construction makes it simple to position the magnet. The built-in drill point locator makes accurate placement effortless. An easy twist of the 1¼" capacity drill press unit locks it in place on the magnet.

And it's there to stay! Extra power magnet clings to ½" and thicker steel with a giant's grip. This new B&D Magnetic Drill Press needs no cool-off period. It's stable in any direction, provides highest accuracy at all times.

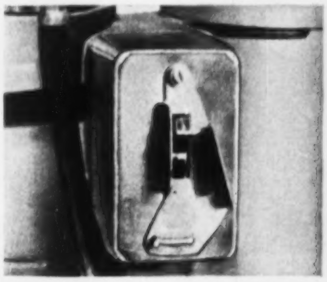
Like the full line of B&D Portable Drills, this new tool is power-packed, quality built. See it for yourself. Mail coupon for free demonstration to THE BLACK & DECKER MFG. Co., Dept. 2110, Towson 4, Md. (In Canada: P.O. Box 278, Brockville, Ont.)



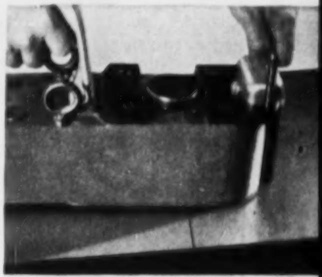
UNITIZED CONSTRUCTION of drill press cannot work loose, no side play, maintains highest accuracy.



SAFETY-GRIP SWITCH keeps magnet always "on" after operator releases switch trigger — another safety plus.

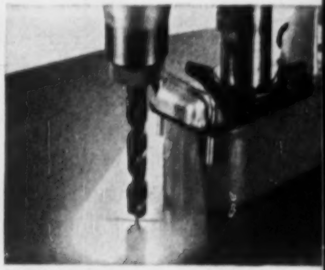


REVERSING SWITCH with time delay prevents motor being reversed too rapidly. Adds longer life — increases safety.



VERSATILE MAGNETIC UNIT can be used apart from drill press to hold pieces for butt welding and other jobs.

DRILL POINT LOCATOR provides accuracy never before possible. Gets close tolerances fast. Built into magnet.



EXCLUSIVE HEADLIGHT directs bright beam on work area. Special ruggedized bulb withstands hard usage.

Look Under "TOOLS-ELECTRIC" in "Yellow Pages"

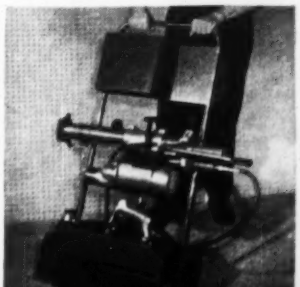
Leading Distributors Everywhere Sell

Black & Decker®

Quality Electric Tools—Power-built to set the pace

DRILLS IMPACT WRENCHES SANDERS SHEARS NIBBLERS

EXCLUSIVE TWO-PIECE CONSTRUCTION (magnet separate from drill press) and tool caddy for easier, safer handling. Caddy keeps tool in one place—ready for the job. Unit placed in position with minimum exertion.



MAIL TODAY FOR FREE DEMONSTRATION

The BLACK & DECKER MFG. CO., Dept. 2110, Towson 4, Md.

☐ Please arrange a demonstration of the new B&D Magnetic Drill Press.

☐ Please send me additional information.

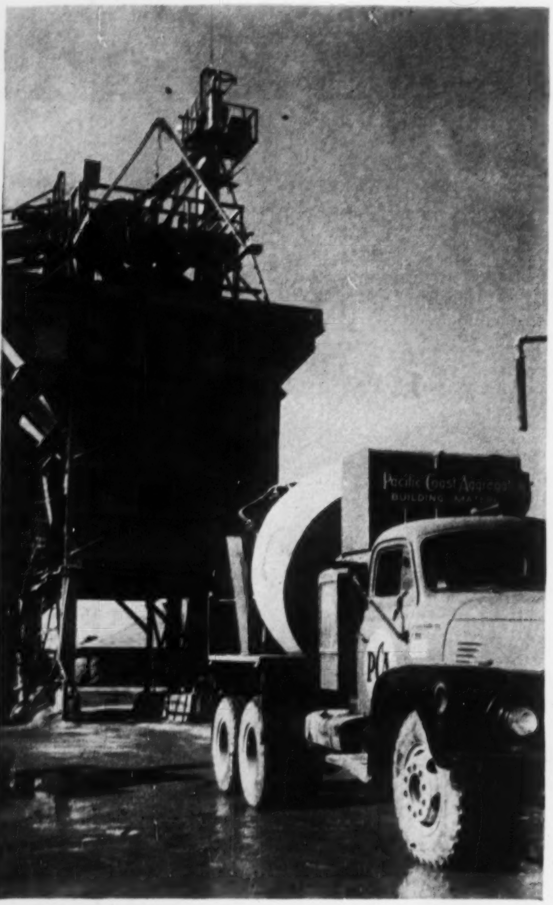
Name.............................Title..........

Company...

Address...

City...........................Zone....State.....

Pacific Cement and Aggregates, Inc. proves:



Pacific Cement and Aggregates has fifteen radio base stations, each handling dispatching from a batch plant. Shown above is the base station at Hayward, California (antenna at top of hopper). They now have 165 mixer trucks and 15 cars and pick-ups equipped with mobile radio.

Fewer trucks per job, less overtime with General Electric two-way radio

General Electric two-way radio means faster, more profitable service. That's why fast-growing Pacific Cement and Aggregates calls it "a valuable tool in selling ready-mixed concrete service to new customers."

PCA has found that two-way radio cuts down the number of trucks needed on a given job. When faced with unavoidable delays or cancellations, radio permits PCA to switch trucks immediately to other jobs.

Two-way radio lets PCA keep customers up-to-date on job progress. And when customers make corrections on final loads, this information is relayed directly to the job site. Finishing crews do not have to be held on overtime.

If a breakdown takes place, you too can send repair equipment to the exact spot within minutes. Your servicemen, dispatchers and supervisors—tied together by General Electric two-way radio—will have full-knowledge of overall operations at all times.

Find out how better communications can give you more profit from present equipment. Call your local General Electric Communications consultant, listed under "Radio Communication Equipment" in the Yellow Pages. Or write: General Electric Co., Communication Products Department, Electronics Park, Syracuse, N. Y.

2-WAY MOBILE RADIO

Drivers at the job site can instantly report any changes in orders and are under the constant control of the dispatcher. Using G-E two-way radio, PCA has achieved tighter delivery schedules and greater customer satisfaction.

Each base station can communicate by radio with adjacent PCA plants, co-ordinating the movements of concrete trucks delivering out of more than one plant, or in those cases where two plants are providing concrete for one job.

GENERAL ELECTRIC

. . . Oregon Flood Control

(*Continued from page 201*)

Bids: 5-28-57 Items		Unit	Quantity	Unit Prices 1C	2
Drill grout anchor bars		lf	18,000	0.90	1.40
Copper waterstops		lbs	6,000	3.30	2.10
Press grt, fdn		cf	3,000	3.00	2.75
tunnel rings		cf	200	3.00	5.50
Steel, struct	ip	lb	306,000	0.60	0.56
Penstock	ip	lb	1,220,000	0.66	0.46
blkhd lift bm guide		ls	job	18,500	14,500
trash rack		ls	job	23,000	21,000
Outlt blkhd, lft bm & gd		ls	job	40,000	39,000
Misc steel & metwk		lb	30,000	0.75	0.60
Steel rails	ip	lb	2,600	0.36	0.38
Iron castings		lb	8,500	0.58	0.44
Hand railing	ip	lb	4,000	1.00	1.10
Staff gages	ip	ls	job	4,000	4,500
Gates, tainter	ip	ls	job	400,000	366,000
operat mech		ls	job	150,000	160,000
slide & op equip compl	ip	ls	job	500,000	600,000
Emerg generator	ip	ls	job	22,000	19,000
S P & fitg wld 20"	ip	lb	37,000	0.87	0.53
blk, 3-12"		lb	32,500	1.00	0.59
galv, 3-12"		lb	35,000	1.05	0.78
blk, 2½" & less		lb	9,000	1.20	0.73
galv, 2½" & less		lb	9,000	1.40	0.76
CISP & fitg	ip	lb	1,200	0.80	0.86
CIP & fitg	ip	lb	5,000	0.80	0.78
Valv, 20"	ip	ea	1	2,200	4,800
3-12"		lb	2,000	1.60	1.60
2½" & less		lb	125	4.00	7.00
Plumbing fixtures	ip	ls	job	550.00	600.00
Strainers	ip	ls	job	2,600	1,600
Pressure tanks	ip	ls	job	1,100	1,800
Deep well pump with cntrols & access	ip	ls	job	2,000	4,600
Diff & std press gages	ip	ls	job	4,200	600.00
Expan pipe jnts	ip	lb	100	5.00	2.70
Pressure filter	ip	ls	job	1,600	900.00
Hypochlorinator	ip	ls	job	1,600	1,200
Gage well	ip	lb	14,000	0.75	0.46
Copper pipe tube & fitg		lb	300	2.65	6.00
Penstock piezometers, with piping	ip	lb	2,000	2.50	2.20
Air compressor	ip	ls	job	1,100	550.00
Conduit, fitg, ¾"	ip	lf	3,800	2.20	1.75
1"		lf	1,200	2.90	2.20
1¼"		lf	1,700	3.60	2.35
1½"		lf	1,200	4.00	2.50
2"		lf	1,600	4.80	3.00
3"		lf	1,400	7.00	5.00
non-met 2"		lf	2,200	0.90	2.10
3"		lf	3,900	1.10	2.30
Spec cast boxes, galv	ip	lb	300	3.10	2.50
Stl boxes, galv	ip	lb	60	5.00	2.70
Wire, 600 v, sngl cond					
#12		lf	8,700	0.30	0.15
#10		lf	650	0.34	0.24
#8		lf	450	0.42	0.35
#6		lf	3,200	0.54	0.40
#4		lf	6,000	0.65	0.46
250 MCM		lf	7,100	1.75	1.90
Cable 1000 v, 1/c #19/25		lf	7,100	0.32	0.24
5/c #19/25		lf	2,450	0.70	1.60
Bare copper grd conduct	ip	lb	5,100	2.10	2.29
Light system, compl		ls	job	7,000	6,500
Cable trays	ip	lf	68	19.00	7.50
480 v 30 a recept		ea	11	49.00	46.00
Code call signals	f&i	ls	job	210.00	700.00
Spillway distrib cntr		ls	job	1,700	2,000
Intake mtr cntrl ctr, compl		ls	job	24,000	20,000
Water gaging equip		ls	job	300.00	3,200
Cable racks, complete		ls	job	420.00	280.00
Circ brkrs, non-auto, compl		ls	job	800.00	900.00
Archt feat-adit bldg		ls	job	4,000	12,000
Heating & ventilating		ls	job	4,000	12,500
Elevator, compl		ls	job	24,000	31,000
Conc gravity anchor,	ip	ea	1	1,000	2,000
Drill eye bar anchors		lf	60	17.00	26.00
Permanent trash booms		lf	4,500	16.00	12.75
Clearing & grubbing		ls	job	50,000	295,000
Exc, uncl		cy	55,000	2.40	1.60
Prel fdn cleanup		sy	10,000	0.68	1.80
Embank, uncl, road detours & rdwy left abut		cy	126,000	0.70	0.84
Final foundation cleanup		sy	48,000	1.08	2.25
Sprinkling		Mgal	30,000	1.50	2.00
Rounding cut banks		lf	1,700	1.90	0.50
Culv excav, uncl		cy	300	8.75	5.00
CMP 18" 16g	ip	lf	390	7.60	6.20
24" 14g		lf	350	11.50	9.50
30" 14g		lf	120	14.00	12.50
36" 12g		lf	66	20.00	18.00
Base course	ip	cy	13,000	4.50	4.00
Leveling course	ip	cy	2,000	6.00	5.00
Detour bridges		ls	job	350,000	112,000
Signs & traf contr devices		ls	job	8,000	9,000

Completion Schedule		Liquidated Damages per calendar day
Exc right abut & portal east & west side roads,	8-1-58	$250.00
Left abut drainage tunnel,	11-1-58	100.00
Exc in & constr near powerhouse area,	12-1-58	250.00
Constr upstream gravel embank el 1410,	11-1-59	250.00
All other work,	1-1-61	500.00

(*Unit Prices cont'd on p. 206*)

*NEW
BUCK
POOP DECK
ACCESSORY

BUCK

puts Concrete
where YOU need it —
when YOU need it

Avoid costly down-time. The Portable Buck Hoistower equipped with the ⅝ cu. yd. clean-dumping concrete bucket actually moves 97 yds. of concrete . . . and more . . . in three hours.

FAST? In 23 minutes—from towing to working—your first load of concrete is up.

STRONG? With the *new 25 hp. engine* a 2500 lb. load can be hoisted 100 ft.—and then some!

***VERSATILE?** With the *new Buck Poop Deck* accessory—built to fit any old or new model Buck Hoistower—contractors can hoist loads of masonry and other materials in between concrete loads without changing the platform.

Whether it be the platform, concrete bucket, Buck Poop Deck or Chicago Boom, depend on Buck.

For free literature—and to action test this machine—see any of the 73 Buck dealers or write direct.

BUCK EQUIPMENT CORPORATION

720-E ANDERSON FERRY ROAD,
CINCINNATI 38, OHIO
In Canada: London Concrete Machinery Company
London, Ontario
In England: Millars Machinery Co., Ltd.
London, E.C. 2.

Big Thompson Plant Tops Out Colorado Project

This is the last and the smallest of the six powerplants in the Colorado Big Thompson Project and will complete the project. It is eight miles west of Loveland at the entrance to the Big Thompson Canyon close to the Flatiron power and reversible pumping plant.

The Davis & Butler Construction Co. of Salt Lake City, Utah took the contract at $461,226. G. R. Highley is project manager for the Bureau of Reclamation.

The turbine is a 6,300 hp vertical-shaft unit. It will operate under a 178 ft head. The generator capacity is 4,500 kw.

Work started on this unit of the project in July is scheduled to be completed in June 1959.

Minimum wages set include: carpenters $2.65, cement masons $2.65, electricians $2.80, ironworkers, structural or reinforcing $3.10, common labor $1.95, power equipment operators $2.15-2.90.

The bidding included:

1C	Davis & Butler Constr Co., Salt Lake City, Utah	$461,226
2	Eagle Constr Corp., Loveland, Colo	499,585
8	Berglund-Cherne Co., Denver, Colorado	969,777
EE	Bu of Reclamation, Loveland, Colo	431,284

Bids: 5-9-57 Items	Unit	Quantity	Unit Prices 1 C	2
Unwatering foundations	ls	job	$17,899	$6,000
Exc, com for PP site, serv yd & access rd	cy	2,250	2.34	0.60
for structures	cy	3,000	3.64	3.00
rock, for structures	cy	1,350	5.88	6.00
all cl, stl penstock trench	cy	3,000	4.12	12.00
channel	cy	1,550	4.40	6.00
from borrow	cy	200	4.70	1.75
Backfill about struct	cy	2,200	2.35	0.60
for stl penstock	cy	1,600	2.05	2.00
compact about struct	cy	1,600	2.05	3.60
sand for buried insul elect cables	cy	160	5.90	4.25
Gravel surfacing	cy	210	5.80	6.70
sand, bed for riprap	cy	20	12.00	5.50
Riprap & rock fill	cy	100	11.75	8.50
Treat areas with steril chem	sy	70	1.80	0.55
CMPC, 12" f&l	lf	84	4.75	3.60
sewer pipe, 8", f&l	lf	35	12.00	2.40
6", f&l	lf	220	3.50	1.90
4"VC f&l	lf	170	2.30	1.90
Conc 1st-stage Power Plant structure	cy	580	58.75	62.00
2nd stage	cy	120	58.75	60.00
misc structure	cy	560	58.75	92.00
Cement, f&h	bbl	1,900	6.47	7.70
Stl reinf bars f&p	lb	165,000	0.18	0.21
Corkboard jnt filler, 1" f&p	sf	130	2.30	1.35
Rubber water-stops, tp E f&p	lf	55	6.00	8.50
tp F	lf	180	2.35	5.70
tp H	lf	135	3.60	8.50
metal seals tp NI f&p	lf	650	1.18	2.20
Conc floor hardner f&a	sy	120	1.20	1.20
Remov exist conc	cy	33	30.00	72.00
Memb waterproofing f&p	sf	850	1.18	0.60
Well, ID prec-conc 36" f&i	ls	job	470.00	250.00
Access wells, prec-conc, f&i	ea	2	352.00	255.00
Steel, stru, crane rnwy f&e	lb	42,000	0.28	0.31
Traveling crane, 20 t, fi&t	ls	job	30,525	31,500
Entrance struct f&e	ls	job	4,690	6,500
Steel penstock f&i	ls	job	54,224	77,460
Steel switchyard struc. f&e	lb	8,000	0.47	0.45
Chain link fence f&e	lf	190	10.50	9.30
Hydr turb, 6300 hp V shaft i&t	ea	1	12,150	11,500
gate shaft tp gov i&t	ea	1	4,265	4,000
Slide gte 72"x72" fr & opr i	ea	1	1,292	3,400
Handwh suppt & oper, 6" i	ea	1	235.00	145.00
Trashracks i	ls	job	587.00	120.00
Bulk gates, seats, guides & hst for 2 draft-tube outlets i	ls	job	940.00	2,560
Turbine flowmeter i	ls	job	470.00	110.00
Sump pumps & float switch i	ls	job	284.00	760.00
Receiver-mtd air compres i	ls	job	470.00	97.00
Tanks, 2 400-gal, V, oil stor i	ls	job	470.00	145.00
oil sump & oil pump i	ls	job	411.00	70.00
water pressure tank i	ls	job	470.00	180.00
Pump, water-supply i	ls	job	235.00	70.00
Fire hose cabinets 2 & serv cabinet 1 f&i	ls	job	822.00	600.00
Door & louvers in floatwell house f&i	ls	job	442.00	330.00
Insul in hatch cover f&a	sf	180	2.35	0.36
Misc metalwork f&i	lb	12,000	0.35	0.62
Heating & vent equip f&i	ls	job	2,925	1,640
Plumbing fixt & toilet-room access f&i	ls	job	414.00	360.00
Constructing seepage pit	ls	job	235.00	340.00
CISP & ftg 6" & less. f&i	lb	3,100	0.59	0.40
CIP, B&S and Fl, ftgs, 6" & over f&i	lb	3,150	0.88	0.48
SP & fitgs sch 10, 18" OD f&i	lb	2,300	0.76	0.80
2" & less nom φ.	lb	1,800	1.06	1.35
2½" to 8" incl f&i	lb	2,500	0.94	1.00
Valves, 2" & less nom φ f&i	lb	300	4.10	3.30
2½" & over f&i	lb	1,800	1.76	2.20
Protect ctg, to buried stl oil P, 2" & less f&a	lf	30	2.40	1.20
Pipe hangars & supports f&i	lb	500	1.76	1.20
Grounding systems f&i	lb	1,200	3.53	nb
Elect met conduit, 1" & less f&i	lf	1,700	2.06	nb
1½" f&i	lf	1,300	2.64	nb
2", 2½" & 3" f&i	lf	200	5.64	nb
Nonmet 3" & less f&i	lf	1,050	2.00	nb
4" f&i	lf	20	4.17	nb
Insul elect control cable 600v, under 7/8" i	lf	8,000	0.47	nb
⅞" 1¼" i	lf	2,000	0.87	nb
Single-condtor, #12 AWG 600v insul elect wire f&i	lf	3,500	0.16	nb
#10 AWG f&i	lf	1,200	0.21	nb
# 8 AWG f&i	lf	900	0.28	nb
# 6 AWG f&i	lf	1,300	0.34	nb
# 2 AWG f&i	lf	200	0.65	nb
#1/0AWG f&i	lf	100	0.94	nb
#4/0AWG f&i	lf	210	1.50	nb
Generator & main exciter & appurt equip i	ea	1	17,847	nb
Generator-voltage bus duct i	ls	job	1,334	nb
Transformer, power, KWIA i	ls	job	8,548	nb
112 & ½ kva distrib KWIB i	ls	job	350.00	nb
Generator voltage swtchgr i	ls	job	4,377	nb
Lghtg distr panel board f&i	ls	job	288.00	nb
Lghtg fixtures, indoor f&i	ea	16	29.00	nb
outdoor f&i	ea	6	70.00	nb
Lghtg sys wiring devices f&i	ea	18	8.00	nb
Cable, 8,000v main lead i	lf	90	11.00	nb
neutral lead i	lf	60	4.60	nb
alum pwr cable sup f&i	lb	200	1.65	nb
Neutral grounding equip i	ls	job	335.00	nb
Metal cable trays f&i	sf	100	4.48	nb
Starters size 0-3 i	ea	6	38.00	nb
Distrib panels, 2AC & 1 DC i	ls	job	410.00	nb
Battery charger i	ls	job	428.00	nb
Current transfmr cabinet i	ls	job	109.00	nb
Lghtg & misc pwr transf i	ls	job	112.00	nb
Pwr receptacles & plugs f&i	ea	5	79.00	nb
Misc contr devices & instruments i	ea	6	34.00	nb
Station storage battery i	ls	job	1,269	nb
Buses in switchyd f&i	lb	350	4.58	nb
Bus insulators f&i	ea	15	24.00	nb
Gang operated air switch i	ls	job	329.00	nb
Fuse disconnect switches i	ls	job	266.00	nb
Lightning arrest 3 sta tp i	ls	job	260.00	nb
Switchyd appr span, 13.8 i	ls	job	752.00	nb
Elect serv penstock intake struc area i	ls	job	928.00	nb
Remote contr cable in cond or trays, 11 pair #19 AWG f&i	lf	1,750	1.20	nb
Preassemb remote contr cable & messenger, 11 pair #19 AWG f&i	lf	6,500	1.50	nb
Buried, remote contr cable, 11 pair #19 AWG f&i	lf	17,000	0.80	nb
spare, 1 length f	lf	1,250	0.80	nb
Protector cabinets f&i	ea	4	300.00	nb
Test boxes f&i	ea	3	424.00	nb
Poles, 25 ft max f&s	ea	7	75.00	nb
30 f&s	ea	3	100.00	nb
35 f&s	ea	6	120.00	nb
40 f&s	ea	4	150.00	nb
45 f&s	ea	2	150.00	nb
Single guys f&c	ea	7	60.00	nb
double f&c	ea	5	70.00	nb
Guy wire protectors f&i	ea	10	12.00	nb
Contr brd sect & frt mntd equip at Flatiron pwr & pump plant i	ls	job	890.00	nb
Panel mntd record equip at Flatiron plant i	ls	job	344.00	nb
Potential transf, 2 outdoor i	ls	job	341.00	nb
Beam tp guardrail f&e	lf	180	6.00	nb
Timber in struct, treated f&e	Mbm	3	412.00	nb
untreated f&e	Mbm	9	352.00	nb
Guard posts f&s	ea	10	24.00	nb
Optional lump sum bid for items not priced by Bidder 2			(99,662)	69,885

Completion Date: June 1959

Cofferdam and Lock for Barkeley Dam, Kentucky

This first contract on the Barkley flood control, navigation and power project went to L. G. Wasson Coal Mining Corp., Boonville, Ind. for $3,497,900. Cofferdam construction and lock excavation, it is for the Nashville District, Corps of Engineers, U. S. Army. B. H. Antwerp is resident engineer at Grant Rivers, Ky.

At mile 30.6, Cumberland River, Livingston County, Ky., the job involves driving 30 steel sheet piling cells approximately 59 ft in diameter, 2,000,000 cu yd of common excavation, 712,000 yards of compacted fill, 30,000 lin ft of grout hole drilling and 100,000 cu ft of grout.

Besides the cofferdam and excavation the work includes construction of left bank earth embankment and foundation treatment.

The dam itself will be a combination rolled-earth and concrete gravity type with maximum height from foundation to top of 130 ft. Elevations include: base of dam, concrete section 265 ft msl, minimum tailwater 302 ft msl, top of dam 395 ft msl, top of gates 375, minimum pool (50,600 ac) 354 ft msl, full pool for normal operation (62,100 ac) 354 ft msl. Maximum controlled operating level at top of gates will be 96,000 ac.

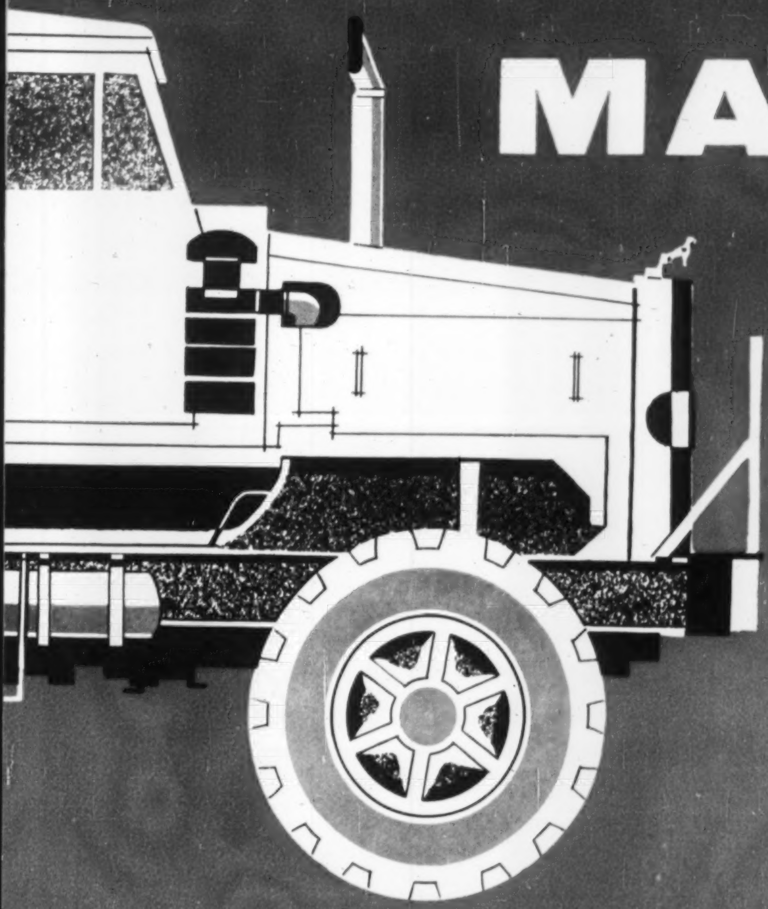
Total storage capacity will be 2,248,000 acf, flood control 1,273,000 acf, power drawdown 282,000 acf, dead storage 693,000 acf.

The lock section, concrete, is 201 ft long, spillway, concrete, 852 ft, power intake, concrete 470, right non-overflow section, concrete, 188 ft, an aggregate length of 1,711 ft. The embankment rolled sections and rolled-earth are 6,274 ft long for a total length of 7,985.

The lock, on the left bank, will be of concrete gravity type with miter gates. The normal lift will be 57 ft, the clear width 110 ft, length of chamber 800 ft. Elevations of sills are 288 and 339 ft, of lower and upper guide walls 350 and 382 ft.

Contracts for the dam, powerhouse equipment and powerhouse will follow this initial contract.

(*Continued on page 213*)



NEW MACK

heavy-duty four- and six-wheel dumpers

15- to 34-ton capacity

✱ LARGEST SELECTION OF HEAVY DUMPERS

Mack offers you the most complete line of dumpers for mining, quarrying, road building, construction. From heavy-duty 170 horsepower, four-wheel dumpers with 15-ton capacities to super-duty 400-horsepower, six-wheel dumpers with 34-ton capacities, Mack provides the economy and performance that can mean bigger hauling profits for you.

✱ CHOICE OF ENGINES

Mack offers you a choice of engines . . . Cummins diesels in the 300- and 400-horsepower class . . . or Mack Thermodyne and Cummins diesels in the 170 to 205 horsepower class. No need to alter existing maintenance facilities to handle new engine makes...you get the truck you want with the engine you want.

✱ OUTSTANDING PERFORMANCE

When you buy Macks, you know that you are getting top performance, outstanding economy, maximum dependability—qualities that have made Mack the acknowledged heavy-duty truck leader in the industry. Moreover, Mack dumpers are planned for accessibility throughout . . . engines are easily reached, no place in the suspension ever needs adjustment—these and many more Mack features reduce maintenance costs and make routine servicing easier. And in Macks, you get the finest transmissions and axles available . . . made by Mack and found only in Macks!

✱ COMPETITIVELY PRICED

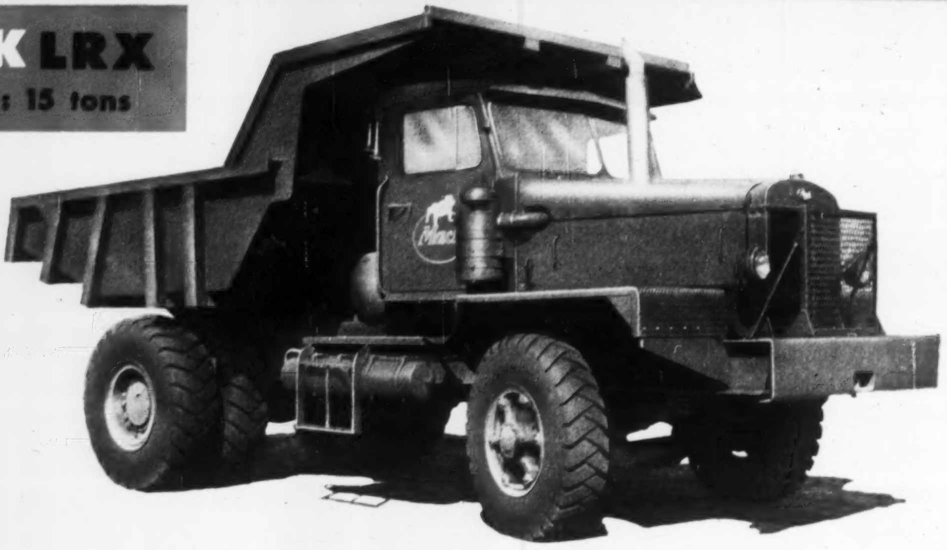
Mack off-highway dumpers are priced right in line with competitive makes. Yet, with Macks, you get those "extras" that mean more payloads at lower hauling costs...cabs engineered for maximum driver efficiency...specially designed components with extensive use of heat-treated alloy steels...single-unit all-welded frames that can take plenty of hard knocks...outstanding performance and economy from a complete line of engines.

✱ STOCK DELIVERY

All 15 and 22½-ton Mack dumpers are available from stock. The units you want with the engines and transmissions you want can be supplied upon gratifyingly short notice. There are no delays, no production schedules for you to worry about. For more information on delivery, contact your local Mack Dealer or Representative.

MACK LRX

capacity: 15 tons



This four-wheel, off-highway dumper combines a big 15-ton rated capacity with outstanding maneuverability. Either a Mack or Cummins Diesel engine—along with heavy-duty clutch, 10-speed transmission, and Mack's Planidrive rear axle assembly—gives plenty of pulling power for long hauls on steep grades. Rugged, unified frame assembly, powerful air brakes, and comfortable cab with driver's position offset to the left assure the top performance and efficiency that have made the LRX a highly popular dumper in mine, quarry, and road-building operations.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:	14.00-24 Rear Tire
Wheel Base	13′ 4″
Platform	9′ 1″
Overall Width	9′ 11″
Overall Height	10′ 8″
Overall Height (Body Raised)	18′ 8″
Overall Length	24′ 7½″
Turning Circle Diam. (To outside edge of tire)	60′
Weight (Chassis, Body & Hoist)	33,000 lbs.
Payload	30,000 lbs.

ENGINE (Diesel):

Model	END 673
Make	Mack, Thermodyne
Type	Naturally aspirated
Number of cylinders	Six
Bore and stroke	4⅛″ x 6″
Piston displacement, cu. in.	672
Brake horsepower @ 2100 r.p.m. (gov.)	170
Max. torque @ 1200 r.p.m.	480 lb.-ft.

CLUTCH (Available with END 673 only):

Type	Mack single-plate, dry
Area of engagement, sq. in.	253

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 50 Amp. (24 V., Starting)

TRANSMISSION:

Type	Mack selective, constant mesh
No. of speeds, forward	Ten
reverse	Two

FRONT AXLE:

Make	Mack Reversed-Elliott, drop forged I-beam

REAR AXLE:

Make	Mack Planidrive
Drive	Dual Reduction
Final Drive (3rd reduction)	Planetary gear train within wheel hubs
Total Ratio	16.5

BRAKES (Air):

Compressor	Tu-Flo
Type	Internal expanding
Front, size	17¼″ x 5″ x ¾″
Rear, size	20″ x 7″ x ¾″
Hand, size	12″ x 5″ x ⅜″, Bendix

FRAME:

Side-members, size	12½″ x 6¾″ x ½″, wide flange I-beam, rolled section
Section modulus	60.7 (per rail)

SPRINGS:

Front, type	Semi-elliptic
Rear, suspension	Semi-rigid, axle mounted to frame

WHEELS:

Type	Cast, spoke

STEERING GEAR:

Control	Manual

TIRES:	Front	Rear
Size	12.00-24 (16P) Rib	14.00-24 (20P) Lug

CAB:

Type: Heavy-duty off-highway, closed, all-steel welded. Offset 10¾″ to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Front and rear tow pins; air horn on cab roof; cab entrance steps and platforms; rear view mirror, left side; channel type front bumper; dual windshield wipers; vertical exhaust; stop-tail light; rim lug wrench and handle.

HOIST:

Make & model	Heil

Type-Twin, double-acting, 8″ diameter, hydraulic cylinders with 24″ stroke, 70° dumping angle.

BODY:

Type	Rock, with scoop end
Make	Heil
Capacity, line of plate	9.8 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ⅜″ sides and header; ½″ wear and side bevel plates; ¼″ canopy. 3″ x 5 lb. channels between floor plates either side of a 1⅝″ edge-grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE (Diesel):

Model	NHB	ENDT 673
Make	Cummins	Mack, Thermodyne
Type	Naturally aspirated	Turbocharged
Number of cylinders	Six	Six
Bore and stroke	5⅛″ x 6″	4⅛″ x 6″
Piston displacement cu. in.	743	672
Brake horsepower @ 2100 r.p.m. (gov.)	200	205
Max. torque @ r.p.m.	1200	1400-1600
pound-feet	537	560

CLUTCH (Included with NHB and ENDT 673):

Type	Mack two-plate, dry
Area of engagement, sq. in.	416

TIRES:	Front	Rear
Size	13.00-24 (18P) Rib	16.00-25 (20P) Lug

BODY:

Type	Flared Quarry
Make	Heil
Capacity, line of plate	11 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ½″ sides; ½″ header, slope; 5/16″ header, vertical; ½″ wear plate; ¼″ canopy. 3″ x 5 lb. channels between floor plates either side of a 1 9/16″ edge-grain hardwood middle section filler.

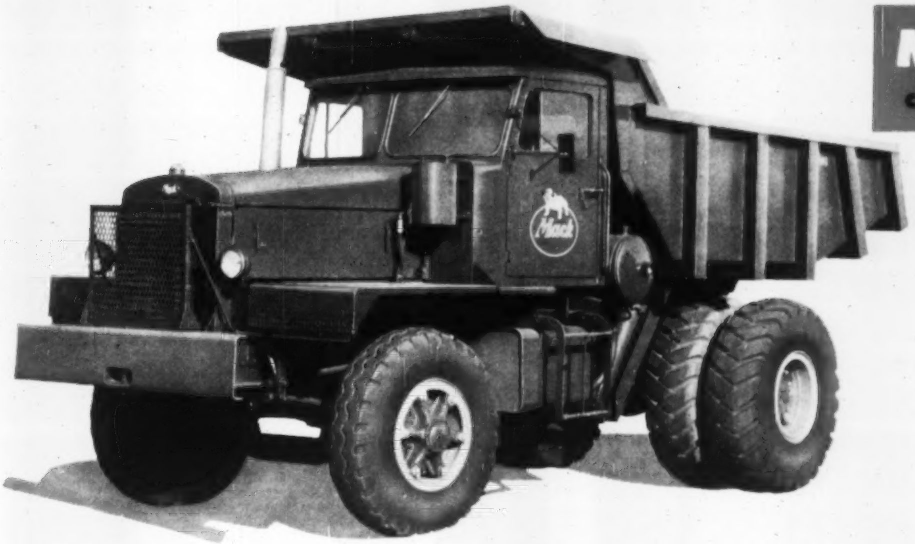
Body Equipment: (for std. and opt. bodies) (9) ¼″ x 6″ alloy wear bars; rock ejectors; ½″ alloy wear plate; horizontal bolsters (3 per side); canopy, loose for export shipment. (for std. body only); exhaust heating connections; welded-on side boards.

CHASSIS EQUIPMENT: Automatic radiator shutters; Wagner "BB" (24 hour chart 0 3500 r.p.m.) tachograph, in place of standard Tachometer; speedometer; hubodometer, left front wheel; Vickers power steering; front wheel limiting valve; hand control valve to operate rear service brakes; low air pressure indicator, Wig-Wag type; screen type radiator guard; 25,000 B.T.U. hot water cab heater with defrosters; spare rim; hydraulic jack, 20-ton; air starting; cold starting equipment; insulating dash mat.

MACK — FIRST

MACK LVX

capacity: 22½ tons



This four-wheel dumper with its 22½-ton rated capacity provides maximum payloads at minimum unit cost. Equipped with either a 300 or 335-horsepower engine, over-gear transmission with two-speed compound or torque converter, and Mack's exclusive Planidrive rear axle assembly, it is powered to give top performance under the most punishing operating conditions. All-welded, single-unit, alloy-steel frame gives LVX's stamina and rugged durability. Elbow steering column, hydraulic steering booster, two-plate air-assisted clutch, and job-engineered cab with extreme left driver position assure maximum operating efficiency. From top to bottom, this big Mack gives you the "extras" that mean minimum hauling costs.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	14' 2"
Platform	9' 11"
Overall Width	11' 2"
Overall Height	11' 4⅝"
Overall Length	26' 7½"
Overall Height (Body Raised)	21'
Turning Circle Diam. (To outside edge of tire)	62'
Weight (chassis, body & hoist)	40,800 lbs.
Payload	45,000 lbs.

ENGINE (Diesel):

Model	NHRBIS
Make	Cummins
Type	Supercharged
Number of cylinders	Six
Bore and stroke	5⅛" x 6"
Piston displacement, cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	300
Max. torque @ 1500 r.p.m.	818 lb. ft.

CLUTCH:

Type	Mack Two-plate, dry
Area of engagement, sq. in.	416
Actuation	Manual, with air assist

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 50 Amp. (24 V. Starting)

TRANSMISSION:

Type	Mack selective, constant mesh
No. of speeds, forward	Eight
reverse	Two

FRONT AXLE:

Type	Mack Reversed Elliott, drop forged I-beam

REAR AXLE:

Make	Mack Planidrive
Drive	Dual Reduction, spiral bevel
Final drive (3rd reduction)	Planetary gear train within wheel hubs
Total Ratio	17.66

BRAKES (Air):

Compressor	Tu-Flo
Type	Internal expanding
Front, size	17¼" x 5" x ¼"
Rear, size	18" x 10" x ¼"
Hand, size	12" x 5" x ⅛"

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	13 11/16" x 8" x ⅝" (Fabricated)
Section modulus	74.8 per rail

SPRINGS:

Front	
Type	Semi-elliptic
Suspension	Mack rubber shock insulators
Rear	
Type	Progressive rate, semi-elliptic
Suspension	Cam face slipper ends with radius rods

TIRES:	Front	Rear
Size	14.00-24 (16P) Rib	18.00-25 (24P) Lug

WHEELS:

Type	Cast, spoke

STEERING GEAR:

Power steering assist	Vickers hydraulic booster

CAB:

Type	Heavy-duty off-highway, closed, all-steel, welded. Cab offset 10¾" to left of chassis centerline provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Screen type radiator guard; front and rear tow pins; air horn on cab roof; dual windshield wipers; two air reservoirs; rear view mirror, left side; Mack power take-off and control (not available with Allison Transmission); door in hood side for access to oil filler and dip stick; exhaust through hood with inline muffler; channel type front bumper; stop tail light; rim lug wrench and handle.

HOIST:

Type	Twin, double-acting, outboard mounted, three section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement providing a 70° dumping angle.

BODY:

Type	Rock, with scoop end
Make	Heil
Capacity, line of plate	14.8 cu. yds. struck

Construction: ¼" steel plate shell bottom; ⅛" sides and header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE:

Model	NRTO
Make & type	Cummins, turbocharged
Number of cylinders	Six
Bore and stroke	5⅛" x 6"
Piston displacement, cu. in.	743
Brake H.P. @ 2100 r.p.m. (gov.)	335
Max. torque @ 1500 r.p.m.	900 lb. ft.

TRANSMISSIONS:

Westinghouse Converter and Mack 4-Speed Transmission. Clutch: 2-plate, 17", air actuated.

Allison Torqmatic Converter and Allison Transmission.

Twin Disc Converter and Mack 4-Speed Transmission.

FRONT AXLE: Special Heavy-duty, Reversed Elliott, Drop Forged I-beam.

TIRES:	Front
Size	14.00-24 (20P) Rib

BODY:

Type	Flared Quarry
Make	Heil
Capacity, line of plate	15.2 cu. yds., struck

Construction: ¼" steel plate shell bottom; ½" sides; ⅜" header; ½" wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge grain hardwood middle section filler.

Body Equipment: (for std. and opt. bodies): (9) ¼" x 6" alloy wear bars; rock ejectors; horizontal bolsters (3 per side); canopy toe board; rock guards over tires; canopy, loose for export shipment (for std. body); welded on side boards; exhaust heating connections.

CHASSIS EQUIPMENT: Air starting, Ingersoll-Rand 9HP; Tachograph, Wagner "BB" (24 hour chart 0-3500 r.p.m.) in place of standard Tachometer; Wig-Wag low air pressure indicator; hand control valve to operate rear service brakes; front wheel brake limiting valve; 25,000 B.T.U. hot water cab heater with defrosters; windshield fan mounted on windshield header; hub odometer; engine chrome cylinder liners and stellite inlet valve seats; insulating dash mat; fender to bumper treads; air operated radiator shutter; air operated Thermo-controlled radiator fan hub; speedometer; back up light; hydraulic jack, 30-ton; spare rims.

NAME FOR TRUCKS

MACK LRSW

capacity: 30 tons

Powered by either a 300 or 335-horsepower engine, this 30-ton, six-wheel dumper has what it takes for off-highway operation in mines, quarries and earth-moving projects. Smooth application of power to its balanced, four-wheel drive bogie is obtained by an air-assisted clutch and overgear transmission with two-speed compound or torque converter. Convenient location of controls, angle steering column, hydraulic steering booster, and extreme left driver position give easy and efficient handling. Best materials, precision manufacture, and specially engineered components make the LRSW capable of withstanding the toughest 'round-the-clock hauling.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	16' 10"
Platform	14' 11½"
Overall Width	11' 2⅛"
Overall Height	11' 6½"
Overall Length	29' 2⅛"
Overall Height (Body Raised)	24' 10"
Turning Circle Diam. (To outside edge of tire)	78'
Weight (chassis, body & hoist)	60,000 lbs.
Payload	60,000 lbs.

ENGINE (Diesel):

Model	NHRBIS
Make	Cummins
Type	Supercharged
Number of cylinders	6
Bore and stroke	5⅛" x 6"
Piston displacement, cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	300
Max. torque @ 1500 r.p.m.	818 lb. ft.

CLUTCH:

Type	Mack two plate, dry
Area of engagement, sq. in.	416
Actuation	Manual, with air assist

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 50 Amp. with 24 V., starting

TRANSMISSION:

Type	Mack two lever, Duplex
No. of speeds, forward	Eight
reverse	Two

FRONT AXLE:

Type	Mack Reversed Elliott, drop forged I-beam

BOGIE:

Make	Mack Planidrive
Final drive, type	Four wheel, planetary
Inter-axle differential, type	Mack concentric cam and plunger Power Divider
Carriers	Mack Dual Reduction
Total Ratio	18.18

BRAKES:

Type and actuation	Internal expanding, inclosed, air
Front, size	17¼" x 5" x ¾"
Rear, size	20" x 7" x ¾"
Hand, size	12" x 5" x ⅛"

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	13 11/16" x 8" with ⅝" web and top flange, ⅞" bottom flange
Section modulus	84.5 per rail

SPRINGS:

Type, front	Semi-elliptic
rear	Semi-elliptic, inverted
Suspension, Mack	Rubber Shock Insulators

SHOCK ABSORBERS, FRONT:

Type	Houdaille, hydraulic

TIRES (Lug):	**Front**	**Rear**
Size	14.00-24 (20P)	16.00-25 (20P)

WHEELS	Cast, spoke

STEERING GEAR:

Power steering assist	Vickers hydraulic booster

CAB:

Type	Heavy-duty off highway, closed, all-steel, welded. Offset 10¾" to left of chassis center-line provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Hubodometer; screen type radiator guard; front and rear tow pins; air horn; rear view mirror, left side; exhaust through hood with in-line muffler; channel type front bumper; door in hood side for access to oil filler and dip stick; insulating dash mat; wig-wag low air pressure indicator; windshield wipers; stop and tail light; back up light; rim lug wrench and handle; automatic radiator shutters.

HOIST:

Make	Heil

Type: Twin, double-acting, 10" diameter, hydraulic cylinders with 40" stroke, 70° dumping angle with power return.

BODY:

Make and type	Heil, Rock-scoop end
Capacity, line of plate	21 cu. yds.

Construction: ¼" steel plate shell bottom; ⅜" sides and header; ¾" slope section; ¾" alloy wear and side bevel plates; ¼" canopy. 3" x 7.1 lb. channels between floor plates either side of a 2" edge-grain hardwood middle section filler.

OPTIONAL EQUIPMENT

ENGINE:

Make and model	Cummins, NRTO
Number of cylinders	Six
Bore and stroke	5⅛" x 6"
Piston Displacement cu. in.	743
Brake horsepower @ 2100 r.p.m. (gov.)	335
Max. torque @ 1500 r.p.m.	900 lb. ft.
Turbocharger	Turbine, exhaust driven

TRANSMISSIONS:

Westinghouse Converter and Mack 4 Speed Transmission. Clutch: 2-plate, 17", air actuated.

Allison Torqmatic Converter and Allison Transmission.

WHEELS, TIRES:

Front & rear	
Wheels, type	Cast spoke
Tires, size	16.00-25
Ply-rating, front	20 or 24
rear	24

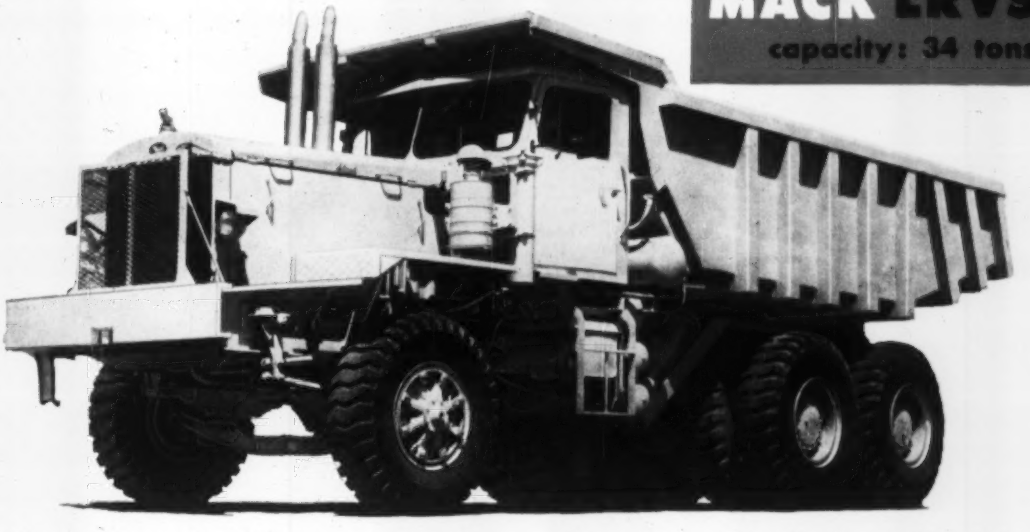
BODY EQUIPMENT: (9) ¼" x 6" alloy wear bars; 1" alloy wear plate; rock ejectors; horizontal bolsters (4 per side); twin body prop; rock guards over tires; exhaust heating connections; canopy, loose (for export shipment).

CHASSIS EQUIPMENT: Air starting, Ingersoll-Rand 9HP; chrome cylinder liners and stellite inlet valve seats; air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500 RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; cab insulated; exhaust outlet under cab suitable for attachment to body for body heating; 25,000 B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; two stop-tail lights; 20-ton hydraulic jack; spare rim.

MACK — FIRST

MACK LRVSW

capacity: 34 tons



The 34-ton rated capacity of this super-payload, six-wheel dumper assures minimum haulage costs for the big earth-moving jobs. Equipped with a 400-horsepower engine, four-speed overgear transmission, hydraulic torque converter or two-speed compound, and a balanced, four-wheel drive bogie, LRVSW's can negotiate severe grades fully loaded. Maneuverability and ease of handling are facilitated by such features as a hydraulic steering booster and air-assisted clutch. Heat-treated, stress-proportioned, single-unit frame gives the structural stamina needed to withstand severest operating conditions. All these features, and many more, contribute to unmatched durability and minimum haulage costs.

CONDENSED SPECIFICATIONS

STANDARD EQUIPMENT

DIMENSIONS:

Wheelbase	16′ 10″
Platform	14 11½″
Overall Width	11′ 2⅜″
Overall Height	11′ 7⅝″
Overall Length	31′ 3⅛″
Overall Height (Body Raised)	25′ 2″
Turning Circle Diameter (To outside edge of tire)	78′
Weight (chassis, body & hoist)	68,000 lbs.
Payload	68,000 lbs.

ENGINE (Diesel):

Model	NVH-1200
Make	Cummins
Type	Naturally aspirated
Number of cylinders	12
Bore and stroke	5⅛″ x 6″
Piston displacement, cu. in.	1486
Brake horsepower @ 2100 r.p.m. (gov.)	400
Max. torque @ 1200 r.p.m.	1,075 lb.-ft.
Fuel tank and location	150 gal., back of cab

CLUTCH:

Make	Lipe Rollway
Type	Two-plate, dry
Area of engagement, sq. in.	571
Actuation	Air

ELECTRICAL SYSTEM:

Voltage and capacity	12 V., 75 Amp.
Generator, make and type	Leece-Neville, alternator

STARTING SYSTEM:

Starting motor, type	Air
Make	Bendix-Westinghouse
Rating, horsepower	25
Cold starting aid	Ether injection

TRANSMISSION:

Type	Mack selective constant mesh
No. of speeds, forward	Four
reverse	One

TORQUE CONVERTER:

Model	Westinghouse 18″
Type	Single stage, hydraulic

FRONT AXLE:

Type	Mack Reversed-Elliott, drop-forged I-beam

BOGIE:

Make	Mack Planidrive
Final drive, type	Four wheel, planetary
Inter-axle Differential	Mack concentric cam and plunger type Power Divider
Carriers	Mack Dual Reduction
Total ratio	18.18

BRAKES:

Type and actuation	Internal expanding, inclosed, air
Front, size	17¼″ x 5″ x ¼″
Rear, size	20″ x 7″ x ¼″
Hand, size	12″ x 5″ x ⅛″

FRAME:

Type	I-beam, wide flange
Material	Alloy steel
Side-members, size	Depth 14¼″, flange width 8″, flange thickness 1″
Section modulus	130.0 per side

SPRINGS:

Type	Semi-elliptic
Suspension, Mack	Rubber Shock Insulators

SHOCK ABSORBERS, FRONT:

Type	Houdaille, hydraulic

TIRES (Lug) Front and Rear:

Size	16.00-25 (20P)

WHEELS:

Type	Cast, spoke

STEERING GEAR:

Type	Worm and roller
Power steering assist	Vickers hydraulic booster

CAB:

Type	Heavy-duty off-highway, closed, all-steel, welded. Offset 10¼″ to left of chassis center-line provides clear vision for driver to rear.

CHASSIS EQUIPMENT: Screen type radiator guard; hubodometer; front and rear tow pins; air horn; rear view mirror, left side; dual exhaust through hood with inline mufflers; channel type front bumper; rim lug wrench and handle; door in hood side for access to oil filler and dip stick; insulating dash mat; windshield wipers; stop and tail light; back up light; automatic radiator shutters.

HOIST:

Make & Type	Heil, twin, double-acting, outboard mounted, four-section telescopic cylinder assembly directly connected to body and chassis through a universal joint arrangement to provide maximum flexibility.
Dumping angle	70°

BODY:

Make & Type	Heil Rock, scoop end
Capacity, line of plate	24 cu. yds. struck

Construction: ¼″ steel plate shell bottom; ⅛″ sides and header, ¼″ alloy wear and side bevel plates; ½″ front slope plate; ¼″ canopy. 3″ x 7.1 lb. channels between floor plates either side of a 2″ edge-grain hardwood middle section filler

OPTIONAL EQUIPMENT

TRANSMISSION (In place of 4-Speed and Westinghouse Converter):

Make & Type	Mack Two-Lever, Duplex
Speeds Forward	8
Speeds Reverse	2

TIRES (Lug) Front and Rear:

Size	16.00-25 (24P)

BODY EQUIPMENT: (9) ¼″ x 6″ wear bars over standard ¼″ alloy wear plate; 1″ alloy wear plate in place of ¼″ alloy wear plate; exhaust heating; rock ejectors; rock guards over tires; twin body prop; horizontal bolsters (5 per side).

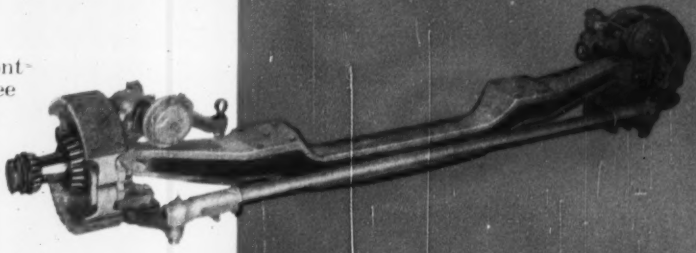
CHASSIS EQUIPMENT: Air operated Thermo-controlled radiator fan hub; Tachograph, Wagner model "BB" (24 hour chart 0-3500RPM) in place of standard Tachometer; speedometer; front wheel brake limiting valve; alcohol vaporizer; 25,000-B.T.U. hot water cab heater with defrosters; solex glass for windshield; windshield fan mounted on windshield header; fender to bumper steel treads; cab insulated; two stop tail lights; spare rim; 20-ton hydraulic jack

NAME FOR TRUCKS

only MACK gives you features like these...

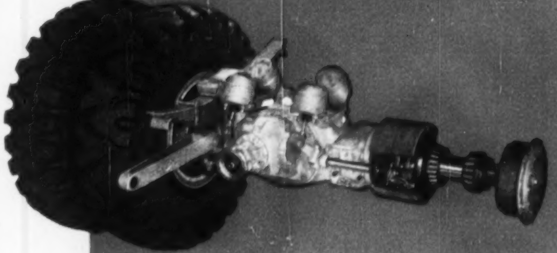
MACK-BUILT FRONT AXLES

Mack's reversed Elliott, drop-forged I-beam front axles are made extra strong for long, trouble-free service. Extensive use of heat-treated steels for crucial parts means minimum maintenance. Straight tie rod and rugged construction of air-actuated brake shoes insure top performance.



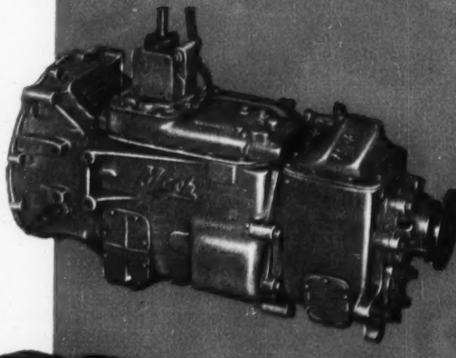
MACK-BUILT 2-WHEEL REAR AXLES

Mack's two-wheel, rear axle assemblies have an unmatched reputation for durability under strenuous service. The strongest, most wear-resistant materials are used throughout. Dual Reduction, gear-type differential and Mack's famous planetary gear reduction at the wheel hubs (Planidrive) provide the smooth distribution of power needed for top truck performance. Planetary gears can be serviced or repaired without removing tires or disturbing wheel bearing adjustment.



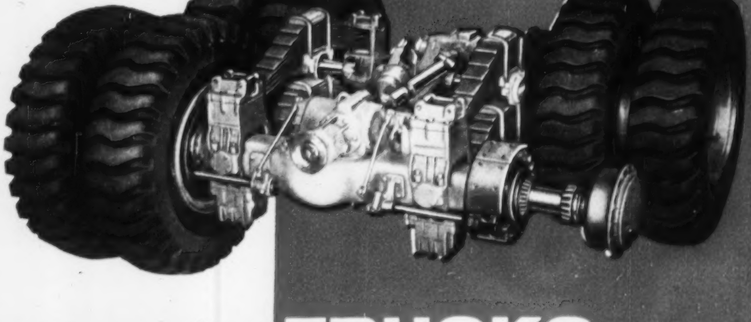
MACK-BUILT TRANSMISSIONS

Dependable performance and long life are standard in Mack transmissions. Shown here is the heavy-duty overgear transmission used for the LRVSW, LRSW, and LVX off-highway dumpers. The four-speed main transmission and two-speed compound are assembled as a unit to give eight forward and two reverse speeds. The four-speed main transmission without the two-speed compound is offered in combination with torque converter. All gears use Mack tetrapoid or quadrapoid tooth design and are drop-forged and case-hardened . . . gears noted for lasting the life of the truck.



MACK-BUILT 4-WHEEL BALANCED BOGIES WITH EXCLUSIVE POWER DIVIDER

Under the worst conditions of mud, loose gravel, or difficult terrain, you get maximum pulling power with Mack's four-wheel drive Balanced Bogies because exclusive Mack Power Dividers apply power to the wheels with traction. Planidrive final reduction gears in all four hubs provide needed reduction without excessively large carriers, differentials, or axle shafts. Maintenance is reduced to a minimum.



MACK first name for TRUCKS

Mack Trucks, Inc., Plainfield, New Jersey • In Canada: Mack Trucks of Canada, Ltd.

. . . Barkley Dam

(*Continued from page 206*)

Minimum wages include: carpenters $2.80, laborers $2.10, piledrivers $3.05, truck drivers $2.23 to 2.63, class A equipment operators $3.15, Class B operators $2.65.

The nine bidders included:

1C	L. G. Wasson Coal Mining Corp., Boonville, Ind	$3,497,900
2	Maxon Constr Co., Inc., Dayton 9, Ohio	3,718,850
9	Mary Const. Inc., Cape Girardeau, Mo., Traylor Bros. Inc., Evansville, Ind	4,776,850
EE	U S Army Engineer, Nashville District, Tenn. (without profit)	3,658,590

Bids: 3-25-57 Items	Unit	Quantity	Unit Prices 1C	 2
Clear & grub	ls	job	$30,000	$90,000
Excavation, stripping	cy	33,000	0.50	0.40
common	cy	2,100,000	0.50	0.50
dental 0 to 10′	cy	1,000	12.50	10.00
over 10′	cy	1,000	15.00	15.00
Prep & clean core trench flr	sy	1,750	5.00	6.00
Comp fill, imperv, earth dam	cy	360,000	0.10	0.26
pervious	cy	100,000	0.07	0.50
imperv, cofferdam dikes	cy	62,000	0.15	0.25
random, RR embank	cy	185,000	0.08	0.20
Addl rolling for compact	hrs	200	10.00	15.00
Mobil- & demobilization	ls	job	1,500	20,000
Drill grt holes, 1st 15,000	lf	15,000	2.85	4.25
over 15,000 lf	lf	15,000	2.75	3.36
Place grout, 1st 25,000 cf	cf	25,000	2.20	2.50
over 25,000 cf	cf	75,000	2.00	1.35
Portland cement in grout	cf	45,000	2.50	1.41
Fly ash in grout	cf	10,000	3.00	0.92
Sand in grout	cf	45,000	1.45	0.26
Connect to grout holes @ $6 ea.	ea	800	6.00	6.00
Piling, sht stl in cells, new	t	6,300	200.00	220.00
new in cut-out walls	t	1,900	195.00	200.00
Unwater & maintain cofferdam	ls	job	160,000	173,000
Pipe culvert	ls	job	2,500	5,000

Completion Schedule: 450 calendar days
Liquidated Damager: $300 per day

Bids Are Close on Wharf For Port of New Orleans

Close bidding put a cargo wharf for ocean going vessels under contract at $1,733,054 to Boh Bros. Construction Co. of New Orleans. W. T. Hogg is chief engineer, Board of Commissioners, Port of New Orleans.

The structure is 1,000 ft long by 230 ft wide and has an additional truck loading area of 22,600 sq ft and a railroad trestle approach to its front apron.

The Port Commissioners furnish steel pipe piles to be assembled by the contractor, also mooring bitts, handhole frames and covers, fire hydrants, creosoted wood piles and timbers for fenders and ingredients for mixing red and aluminum paint for the steel piling.

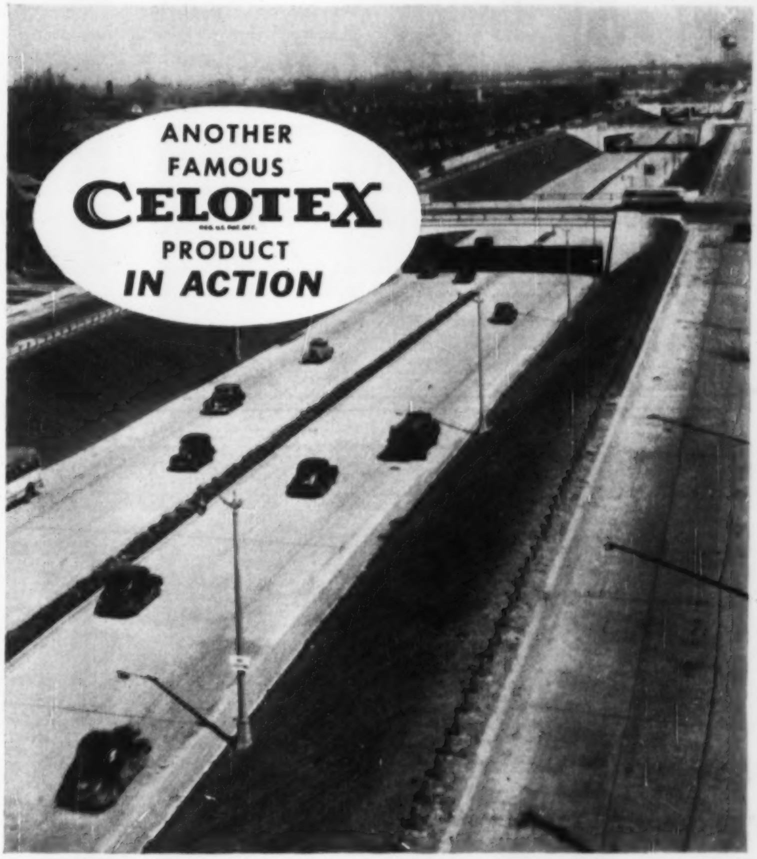
Cast iron pipe is cl 250, AWWA standards. Concrete requires 5½ gal of water per sack of cement and no less than 6 sacks of cement per cu yd of concrete.

Wages in New Orleans include: carpenters $2.85 per hr, common labor $1.60, crane operators $2.925 + 7½¢ fringe benefits.

The five bidders included:

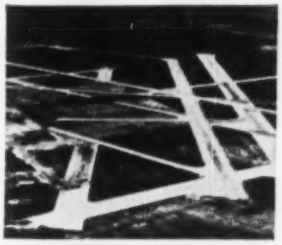
1C	Boh Bros. Construction Co., New Orleans, La	$1,733,054
2	R. P. Farnsworth & Co., Inc., New Orleans, La	1,747,323
5	Farnsworth & Chambers Co., Inc., Houston, Tex.	2,453,818
EE	W. T. Hogg, chief engineer, Bd of Commrs, Port of New Orleans	1,720,000

(*Continued on page 215*)

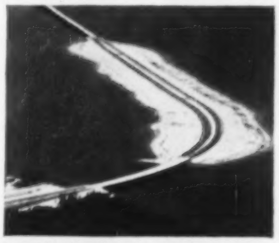


Detroit Express Highway, typical use of Flexcell Joint Filler "wherever concrete meets concrete"

BEST LOW COST PERFORMANCE!



Cleveland Municipal Airport, where 2½ million people landed or took off last year on runways protected by Flexcell Joint Filler.



Rickenbacker Causeway between Miami, Florida, and Biscayne Key. Flexcell Joint Filler contributes to smooth riding and easy maintenance.

FLEXCELL
REG. U.S. PAT. OFF.
EXPANSION JOINT FILLER

1st. Choice Across America!

Men meeting today's road-building challenge know an inch can be a chasm in concrete highway construction. They like the better combination of performance characteristics you get with Flexcell Joint Filler. You'll like its low installation and maintenance cost, too.

COMPRESSIBLE • NON-EXTRUDING • RESILIENT

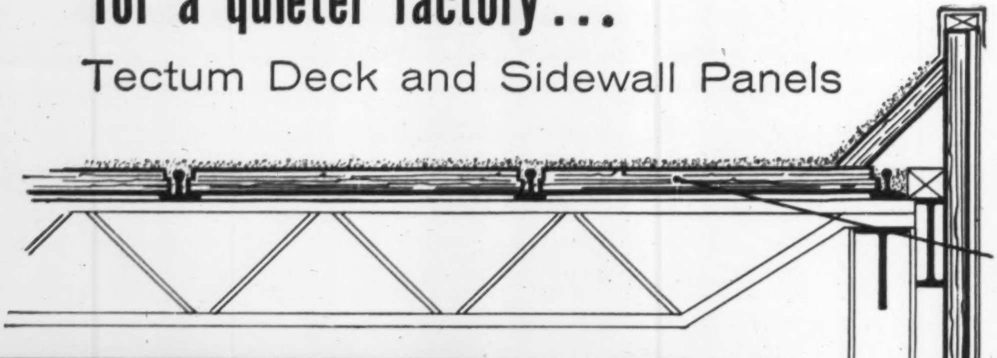
Flexcell Joint Filler bonds firmly to concrete, compresses without extruding. Re-expands to keep joints filled, preventing intrusion of dirt and stones. Uniform asphalt impregnation, 35% by weight minimum. Unaffected by temperature extremes. Tough, rigid, light in weight. Easy to fabricate and install. Delivered to your specifications.

Write for Complete Data Today • No Obligation

THE CELOTEX CORPORATION
120 South La Salle Street • Chicago 3, Illinois

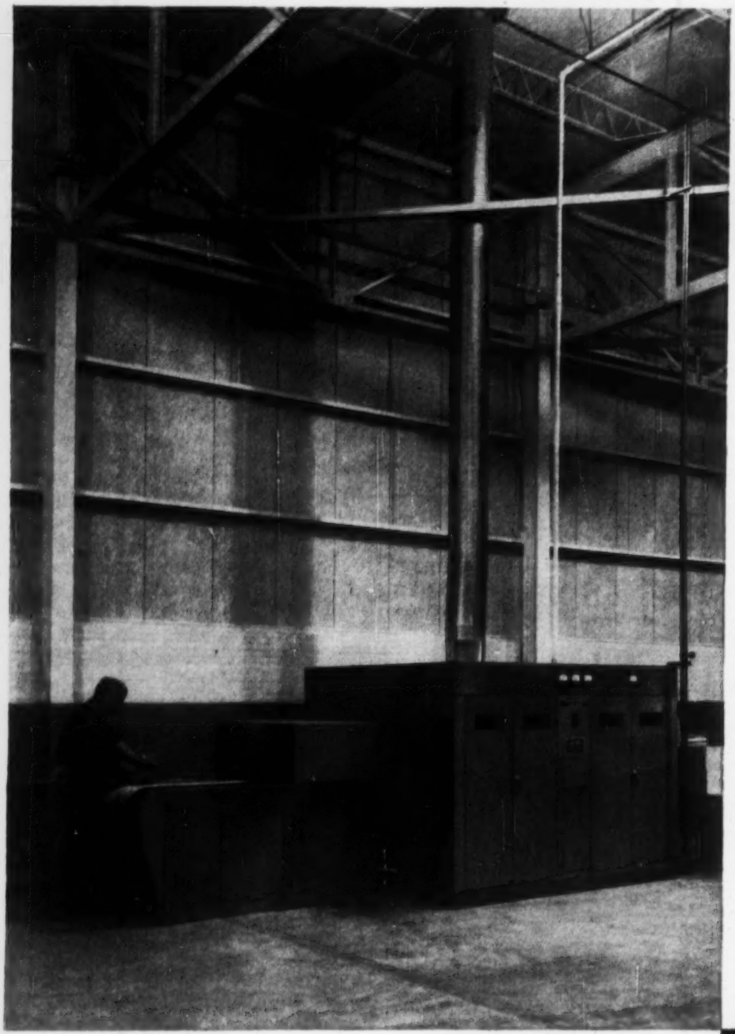
for a quieter factory...

Tectum Deck and Sidewall Panels



Roof decks of Tectum absorb sound, are structural, insulating and noncombustible.

Sidewalls of Tectum are also acoustical—provide a one-two punch for effective noise reduction.



NIBCO, Inc., Elkhart, Indiana
Engineers: Elkhart Bridge & Iron Co.
General Contractor: Wright Construction Co.

When two of the three reflecting surfaces within busy factories become sound absorbing acoustical control systems, noise and confusion are effectively reduced. Tectum Roof Deck Planks and Tectum Sidewall Panels are an ideal combination — homogeneous and functional, eliminating the need for further acoustical materials in your basic structure. And Tectum offers many other advantages in appearance, ease of erection and versatility of application. More and more plants are taking advantage of Tectum's dual benefits for new plant construction. Have you investigated acoustical, structural, insulating, noncombustible Tectum for sidewall applications? Send today for a new eight-page catalog No. C-100-A. Tectum Corporation, 107 South Sixth Street, Newark, Ohio.

District offices in Philadelphia, Atlanta, Columbus, Chicago, Dallas, Seattle and Beverly Hills, California, with distributors in principal cities.

For Quieter Working Conditions and Greater Job Efficiency.

Tectum
CORPORATION

. . . New Orleans Wharf

(Continued from page 213)

Bids: 8-5-57 Items	Unit	Quantity	Unit Prices 1 C	2
Prelim clearing of site	As specified		$2,500	$3,996
Remove asphalt pavement	1,790 sq yds		0.75	1.20

Piling & Timbers

Items	Unit	Quantity	1 C	2
Transport creosoted piles	ea	104	6.00	5.06
lumber	Mbf	26	16.00	34.39
Remove surplus pipe piles	t	50	10.00	13.88
Drive pipe piles 12¾"	ea	2,150	77.00	129.50
14"	ea	325	79.00	138.67
16"	ea	290	81.00	146.25
18"	ea	53	83.00	157.57
add for driving to batter	ea	75	20.00	18.63
Furnish jetting equip	ea	3	500.00	1,500
add for jetting	ea	300	7.00	24.97
Weld joints of type A	lf	5,650	5.00	4.50
type B	lf	4,175	5.30	4.65
Welds for extending piles	lf	2,000	8.00	7.73
Pile bracing	ls	job	93,000	61,336
Fender piles, drive	ea	104	50.00	68.80
cut-offs & caps	ea	104	20.00	26.92
Placing timbers fender	Mbf	20	250.00	264.46
guard	Mbf	5	300.00	149.20
bumper	Mbf	1	250.00	175.00

Earthwork & Bank Protection

Items	Unit	Quantity	1 C	2
Earth fill	cy	30,200	2.18	1.78
Compacted shell fill	cy	575	4.92	8.38
Riprap	cy	4,200	6.00	6.44

Concrete Construction

Items	Unit	Quantity	1 C	2
Conc collars at base of piles	ea	2,128	19.50	18.28
encasements of piles	ea	2,818	21.50	22.24
fill piles method #1	cy	9,280	19.50	16.56
#2	cy	600	21.50	42.48
Wharf deck, flat slab	sy	22,885	24.93	18.97
beam & girder	sy	5,360	39.37	43.49
Trestle	sy	1,075	42.79	46.86
Walls, concrete levee	cy	19	135.00	148.48
others & pedestals	cy	209	105.00	115.39
Curb angles 3½"x3½"x⅜"	lf	1,245	2.39	2.94
Guard angles 2½"x2"x⅜"	lf	3,900	1.47	2.38
Anchor bolts & access 1½"	ea	204	11.00	7.93
1"	ea	52	5.35	5.44
¾"	ea	24	4.25	4.96
Placing handholes 12"	ea	9	15.00	9.33
mooring bits	ea	20	110.00	84.95
Pipe guard posts	ea	88	45.00	32.10
Watchman's doors	ea	2	250.00	179.50
Hand railing on trestle	ls	job	3,000	2,826
Fill rail groves for crane	lf	2,020	0.85	0.90
for railroad	lf	4,242	1.00	0.81

Water Mains & Hydrants

Items	Unit	Quantity	1 C	2
Main in place 12"	lf	1,250	12.56	13.13
6"	lf	150	8.18	8.56
Valve & valve box 12"	ea	1	767.91	803.00
6"	ea	2	226.35	237.00
Gate valves OS&V, 8"	ea	3	217.62	227.67
4"	ea	2	94.90	99.00
Placing hydrants	ea	2	27.32	29.00

Drainage

Items	Unit	Quantity	1 C	2
Culvert 18"	lf	50	7.50	6.56
24"	lf	48	10.00	7.31
Catch basins	ea	2	100.00	188.00

Painting

Items	Unit	Quantity	1 C	2
Painting steel piles & bracing	ls	job	41,000	49,379

Completion Schedule: 365 calendar days
Liquidated Damages: $300 per calendar day

Levee Enlargement Let For Sacramento River

A levee enlargement and setback for California's Sacramento River involves removing and salvaging existing facilities and reinstalling them—in addition to the new construction. The $2¼ million contract offers a variety of alternates to the contractor, H. Earl Parker, Inc., Marysville, Calif. Work is on the left bank of the Sacramento River from Tisdale Weir to Sutter By-Pass in Sutter County. It is under the direction of the Sacramento District, Corps of Engineers.

In addition to levee enlargement and set back the principal features include earth pads or the land side; removal, reinstallation, salvage or waste of existing irrigation facilities, including steel and concrete pipe, concrete and timber boxes, standpipes, slide gates, pump houses, pumps, and motors. New irrigation facilities—soilproofed steel pipe, steel, corrugated metal and concrete pipe, gate riser units and valves—are to be furnished and installed and pumps will be furnished by land owners to be installed. Stone protection involves furnishing and placing quarry rock or cobbles on prepared slopes. Finally, the contractor must shape and cap the levee crown to specified section and surface levees and service roads with crushed mineral aggregate, oil treatment and bituminous road-mix surfacing as specified.

Minimum wage rates include: carpenters $3.00, pipe layers $2.575, all pneumatic, gas and electric tools $2.425, common labor $2.325, scraper and earth-mover operators $3.255, tractor operators $3.095, in tandem $3.425, truck drivers $2.325 to $2.85.

The bidding included:

1	CH. Earl Parker, Inc., Marysville, Calif	$2,256,834 alt 2,259,334
2	Basalt Rock Co., Inc., Napa, Calif	2,262,716
5	McCammon-Wunderlich Co., Palo Alto, Calif	2,426,463
EE	Corps of Engrs., Sacramento District, Sacramento, Calif	2,396,842 2,316,683 alt

Bids: 7-25-57 Items	Unit	Quantity	Unit Prices 1 C	2
Clear & grub	ls	job	$95,000	$92,000
Excavation, common	cy	183,500	0.05	0.35
Levee embankment	cy	1,100,000	0.44	0.42
Earth pad	cy	10,000	0.40	0.50
Shape exist levee crown	sta	73	28.00	30.00
Levee capping	sta	73	40.00	25.00
Water emba compact & dust control	Mgal	61,200	1.00	1.00
Quarry rock				
above low water	t	155,180	nb	4.15
below	t	153,940	nb	4.15
Concrete	cy	70	80.00	110.00
Portland cement	bbl	100	5.00	5.00
Steel, reinf	lb	3,250	0.20	0.25
Crushed min aggregate	t	22,560	2.90	3.50
Road mix aggregate	t	6,180	2.50	3.00
Liq asph, MC-1, prime coat	t	74	40.00	40.00
SC-2 or SC-3 surf treat.	t	57	45.00	40.00
MC-3 or MC-4 binder	t	370	37.00	35.00
Road-mix & compact	sy	37,000	0.15	0.15
Soil proofed SP 6" 10 ga	lf	51	2.90	5.00
8" 10 ga	lf	49	3.60	6.00
10" 10 ga	lf	89	4.50	7.00
12" 10 ga	lf	165	5.25	8.00
14" 7 ga	lf	115	7.65	9.00
16" 7 ga	lf	100	8.60	10.00
18" 7 ga	lf	220	9.50	14.00
24" 7 ga	lf	92	12.50	16.00
30" 7 ga	lf	48	26.00	21.00
SP, 12" 10 ga	lf	46	4.50	6.00
18" 7 ga	lf	75	8.50	11.00
24" 7 ga	lf	58	11.00	14.00
Non reinf conc pipe SS, 8"	lf	27	2.30	3.00
10"	lf	20	2.40	3.50
12"	lf	983	1.50	4.00
18"	lf	15	4.00	5.00
20"	lf	2,100	3.50	6.00
24"	lf	414	5.00	7.00
30"	lf	16	11.00	9.00
36"	lf	30	15.00	11.00
RCP ES, 24"	lf	316	7.50	11.00
72"	lf	52	60.00	70.00
CMP, 10" 16 ga	lf	56	6.30	7.00
24" 12 ga	lf	73	16.00	18.00
30" 10 ga	lf	66	21.00	24.00
36" 10 ga	lf	72	25.00	28.00
Cor met cut-off wall for				
6" SP	ea	1	75.00	60.00
8" SP	ea	1	75.00	70.00
10" SP	ea	2	80.00	70.00
12" SP	ea	2	85.00	80.00
14" SP	ea	2	90.00	80.00
16" SP	ea	1	91.00	90.00
18" SP	ea	2	95.00	90.00
24" SP	ea	2	110.00	120.00
30" SP	ea	1	126.00	150.00
24" CMP	ea	2	150.00	150.00
30" CMP	ea	2	165.00	180.00
36" CMP	ea	2	200.00	200.00

(Continued on page 216)

Do You Have This PIPE PROTECTION PROBLEM?

Underground piping must be protected against destructive forces of corrosive soils and electrolytic conditions. Normally, coal tar coating as called for in AWWA specifications C-203 and C-204 would be hot-applied at a coating mill. However, there are times when the volume of pipe involved or the distance of a coating mill make this impractical from a time and cost standpoint.

You'll find the ANSWER with TAPECOAT® . . . the Quality Coal Tar Coating in Tape Form

TAPECOAT is the widely-accepted alternate material that is equivalent to mill-applied hot coal tar protection. With this easy-to-use material, protection can be applied in the field by your own men, because technical know-how, kettles and special crews are not required. You save time and money while providing the long-life protection called for.

TAPECOAT is easily applied, using a torch to soften or bleed the pitch which gives both bond and protection. Available in widths from 2" to 24", it is spirally wrapped or cigarette wrapped around pipe, pipe joints, couplings, conduit, cable, and insulated piping.

Write for illustrated brochure.

The TAPECOAT® Company

Originators of Coal Tar Coating in Tape Form

1551 Lyons Street
Evanston, Illinois

. . . Sacramento Levee

(Continued from page 215)

Bids: 7-25-57 Items	Unit	Quantity	Unit Prices 1 C	2
Gate riser unit, 8′ 36″	ea	1	735.00	500.00
12′ 42″	ea	1	1,150	900.00
14′ 48″	ea	1	1,600	1,300
Cor met stand pipe, 12′ 42″	ea	1	475.00	600.00
Mechanical coupling, 16″	ea	2	42.00	50.00
22″	ea	1	60.00	70.00
Pipe reducer, 18″x16″	ea	3	120.00	100.00
24″x22″	ea	1	150.00	130.00
Gate valve, 10″	ea	1	370.00	450.00
Siphon breaker, size A	ea	4	85.00	100.00
B	ea	3	125.00	130.00
Alfalfa valve, 12″	ea	1	30.00	35.00
18″	ea	1	70.00	80.00
Air vent, 6″	ea	2	175.00	150.00
Fence, remove	lf	6,700	0.14	0.15
reconstruct	lf	3,000	0.28	0.50
Steel pipe piles, conc filled				
3/16″x 8″	lf	1,084	10.50	15.00
1/4″x10″	lf	576	13.00	18.00
Pump col & shaft, 12″	lf	65	42.00	35.00
16″	lf	55	60.00	70.00
24″	lf	40	100.00	100.00
30″	lf	40	130.00	130.00
Steel, struct	lb	12,500	0.35	0.60
Lumber	Mbm	6,000	0.28	0.60
Conduit, 1½″	lf	1,850	0.95	2.00
Bit coated SP, ¼″x36″	lf	42	50.00	25.00

Lump Sum Bidding

R&S:CMP & gate 35′x15″, CMP 20′x18″ R&W: conc fdn. spillbox, conc headwalls, 117′x30″ conc pipe, 480′ conc ditch lining	750.00	1,500
Rs&r: pump house, pump motor & access R&s: 66′x16″ SP R&W: conc pump pit, standpipe & headwall, 84′ conc cond, wood flood box	6,700	3,000
Rs&r: 87′x24″ SP, 184′x30″ SP, 55′x36″ SP, pump platform & house, pumps, motors & access, coupl & pipe sects with air & vac vlvs R&s: 88′x24″ SP, 46′x30″ SP R&w: wood piling	8,000	6,000
R&s: 190′x16″ SP, pump house, pump, motor & access		
R&w: conc pump pit, install furnished equip inclined pump, pump column, motor, starter panel & appurt	2,600	3,000
R,s&r: 61′x16″ SP, ck vlv & 16″ gate vlv, pump, motor & access R&s: 127′x16″ SP R&w: conc pump pit & platf F&i: 2-20″x16 reducers, 65′x20″ soil proof SP 3ga 28′x72″ RCPES	9,500	7,000
R,s&r: 163′x12″ SP, 2-15″ lift gates, gate vlv, standpipe pump & access R&s: cor met		
R,s&r: 162′x14″ SP cor met standpipe, gate & gate vlv, pump & access	1,400	1,500
R&w: cocn retain wall	850.00	1,000
Rs&r: 24″ gate vlv, 19′x18″ SP, 22′x36″ CMP, pump house R&s: 88′x14″ SP, 30′x24″ SP, pump & access, motor hse, motor & access R&w: conc pipe support conc pump pit, motor block, flr & belt shaft 55′x48″ CP conc headwall Install furnished equip: Inclined pump, motor, pump column, starter panel & appurt	$3,150	$4,000
R&w: conc retain wall	600.00	200.00
R,s&r: 115′x8″ SP, pump motor & access R&s: 21′x8″ SP, pump house R&w: conc pump pit	2,300	1,000
R,s&r: 3-18″ alfalfa vlvs R&w: 2, 100′x20″ CP, 9′x18″ conc riser pipe, 30′x36″ conc standpipe	750.00	2,700
R,s&r: 29′x14″ SP, pump, motor & access coupling R&s: 153′x14″ SP, pipe supports R&w: conc fdn	2,900	1,500
R&s: 78′x14″ SP pump house, motor & access, pipe support & struct mem R&w: conc pump pit	1,500	1,000
R&w: conc retain wall	600.00	300.00
R,s&r: pump, motor, pump column & access, couplings R&s: 62′x36″ CMP slide headgate R&w: conc riser, 92′x24″x30″ conc conduit	3,500	1,500
R,s&r: 8″ gate valve R&s: 145′x8″ SP R&w: conc box	700.00	500.00
R,s&r: 9-8″ alfalfa vlve, 3-12″ alfalfa vlvs, 12″ lift gate R&s: 10′x6″ metal standpipe R&w: 965′x12″ CP, 10′x8″ conc standpipe, 16′x10″ conc standpipe, 10′x24″ conc standpipe, 18′x8″ riser pipes, 6′x12″ riser pipes	700.00	1,500
R,s&r: gate vlv & coupling, pump & access R&s: 142′x10″ SP, 48′x14″ SP R&w: conc pump pit, 2-36″ conc standpipes	2,200	1,700
R,s&r: 142′x10″ SP, pump, motor & access R&s: 40′x10″ SP, pilings R&w: wood distr box, pump platform	1,300	1,400
R&s: gate on levee crown	85.00	50.00
R,s&r: 42′ timber walkway R&s: 53′ timber walkway, 30′x36″ CMP R&w: 17′x36″ CMP conc stilling well base Install furn equip: gaging sta, wood piles SP	11,000	3,000
R&s: 71′x18″ SP, slide headgate motor house, pump, motor & access R&w: 18′x24″ CP, conc, floor, conc riser, 90x2′x2′ conc conduit Install furn equip: inclined pump, motor & pump column, 24″x82′ steel tube F&i: starter panel & appurt for inclined pump Construct: pump house	3,700	3,000
R,s&r: 57′x12″ SP R&s: 39′x12″ SP	525.00	300.00
R,s&r: 62′x10″ SP R&s: 37′x10″ SP	400.00	300.00

Alternate Unit Price Schedule

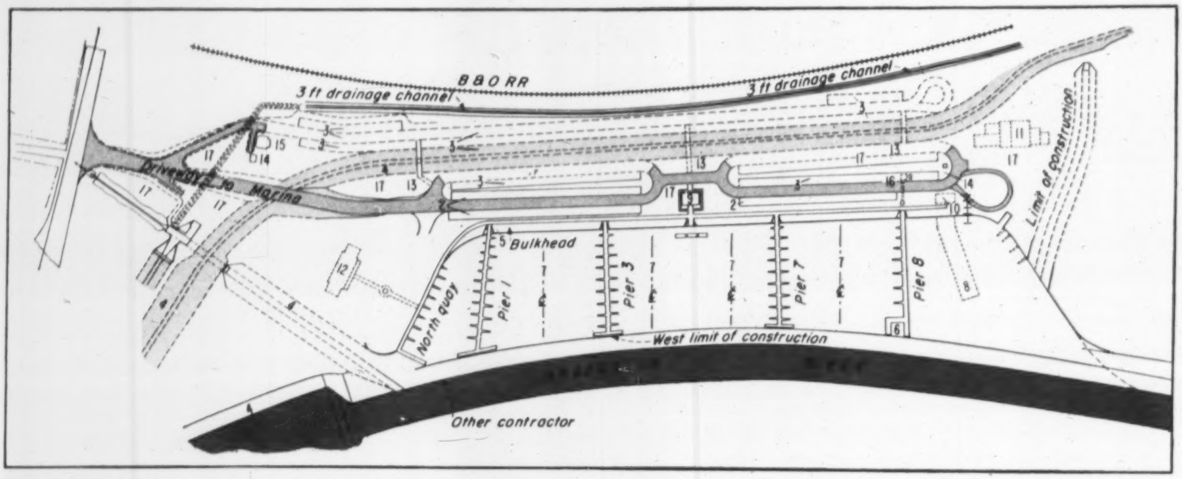
Cobbles, above low water	t	188,410	$3.55	nb
below	t	186,900	3.55	nb

Lump Sum

R,s&r: 56′x16″ SP, pump, motor & access, 16″ gate vlv R&s: 127′x16″ SP, 16″ ck valve R&w: conc pump pit & platform F&i: 70′x36″ CMP 10 ga, 32′x72″ RCPES Construct: base for pipe pump pit, pump pit cov, platform & pumphouse	ls	job	12,000	nb

Completion Schedule: 860 calendar days after written notice to proceed (No work permitted between Nov. 15 and Apr. 15)

Liquidated Damages: $100 per calendar day



MARINA plans for future, too. Facilities include: (1) pump station, (2) parking now, (3) future parking, (4) levees, (5) walk & ramp, (6) fueling berths, (7) future pier, (8) future commercial pier, (9) administration building, (10) future commercial building, (11) future sales-service building, (12) future social center, (13) future walks & steps, (14) sewage pumping station, (15) sanitary sewer junction, (16) underground gasoline storage, (17) seeding & mulching.

Maryland Marina Adopts Timber Bulkhead

In an area mostly below sea level, Washington Suburban Sanitary Commission, is building a $648,059 marina at Bladensburg, Md. as part of its Anacostia Flood Control Project. The contract went to Eastern Shore Dredging Co., of Branchville, Md., who did not bid on the steel bulkhead alternate. It is 6% over the engineer's estimate.

The capacity of this marina will be 147 boat slips under this contract but it is designed for an ultimate capacity of 290 distributed like this:

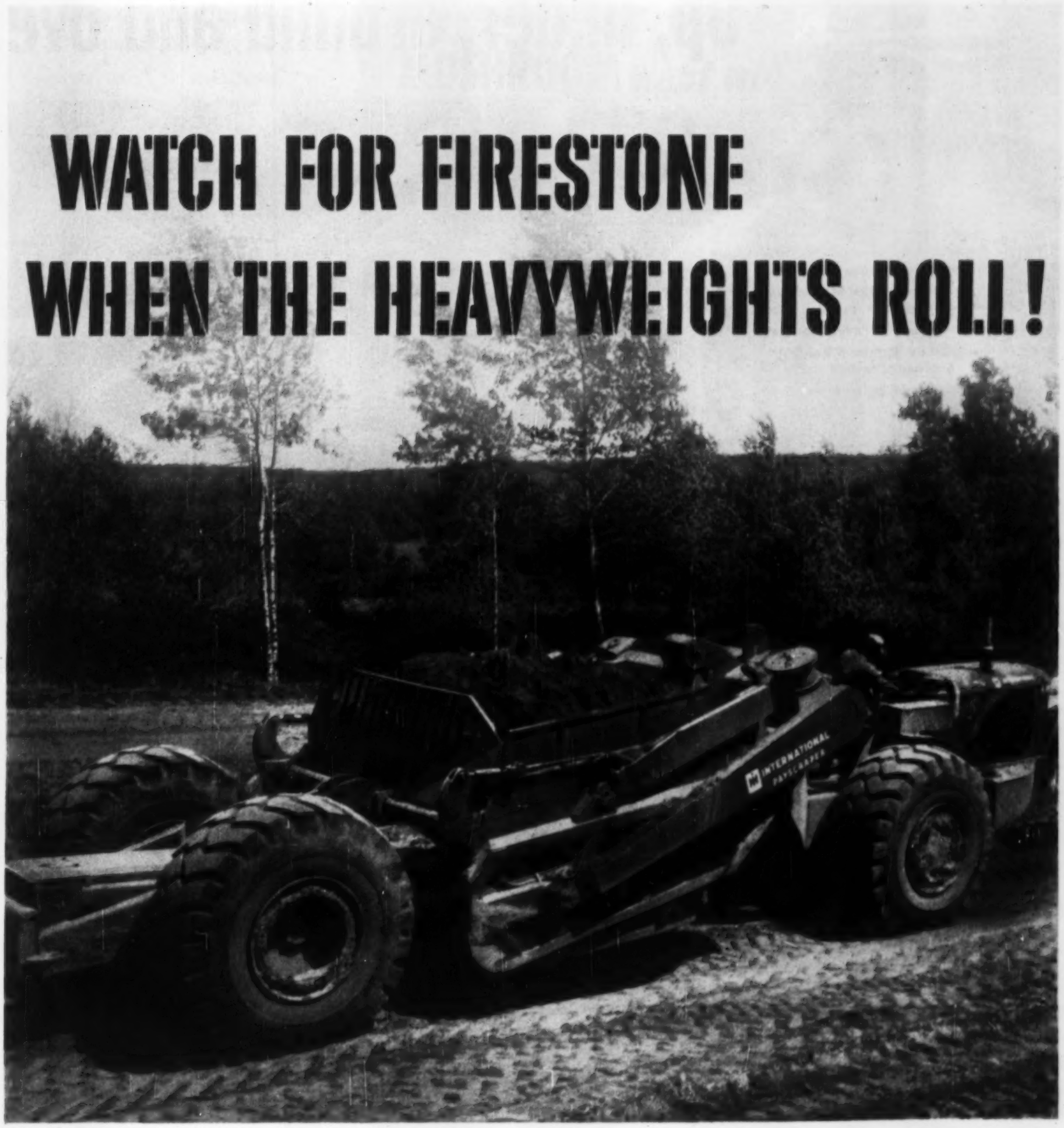
Boat Length	Slips Now	Boat Ult	Boat Length	Boat Now	Slips Ult
35 ft	11	14	24 ft	50	52
32 ft	10	20	20 ft	15	51
30 ft	7	21	18 ft	17	37
28 ft	2	24	14 ft	6	33
26 ft	29	38	Total	147	290

Pier sizes are 285 ft by 8 ft for No. 1, 250 ft by 8 ft for No. 3 and 6 and 285 by 12 ft for No. 8, the fueling pier.

Wage rates prevailing in this area include: carpenters $3.35+9¢ fringe benefit (goes up to $3.50+9¢ May 1, 1958), pile drivers $3.475+9¢ ($3.625+9¢ May 1, 1958), electricians $3.75+6¢ ($3.90+6¢ July 1, 1958) common laborers $2.20+7½¢ ($2.30+7½¢ May 1). All overtime takes double pay.

The bidding included:

(Continued on page 219)



Firestone Tubeless Rock Grips are performance champs on big jobs!

Firestone Tubeless Rock Grips knock down operating costs. Two great tread designs match toughness with traction to ward off all the bruising punishment the meanest terrain can dish out. Rock Grips cut down time-wasting tire changes because they're built for *all* types of terrain. You get *full flotation* to stay "on top" in sand and soft stuff, plus super-strong *armored grip* to take punishing runs over broken rock day after day. Safety-Tensioned *Gum-Dipped®* NYLON bodies, combined with cut-resistant treads, make these heavyweight haulers first choice for off-highway users. Your Firestone Sales Engineer will be glad to show you why they'll be your first choice, too. Contact him today through your local Firestone Store or Dealer.

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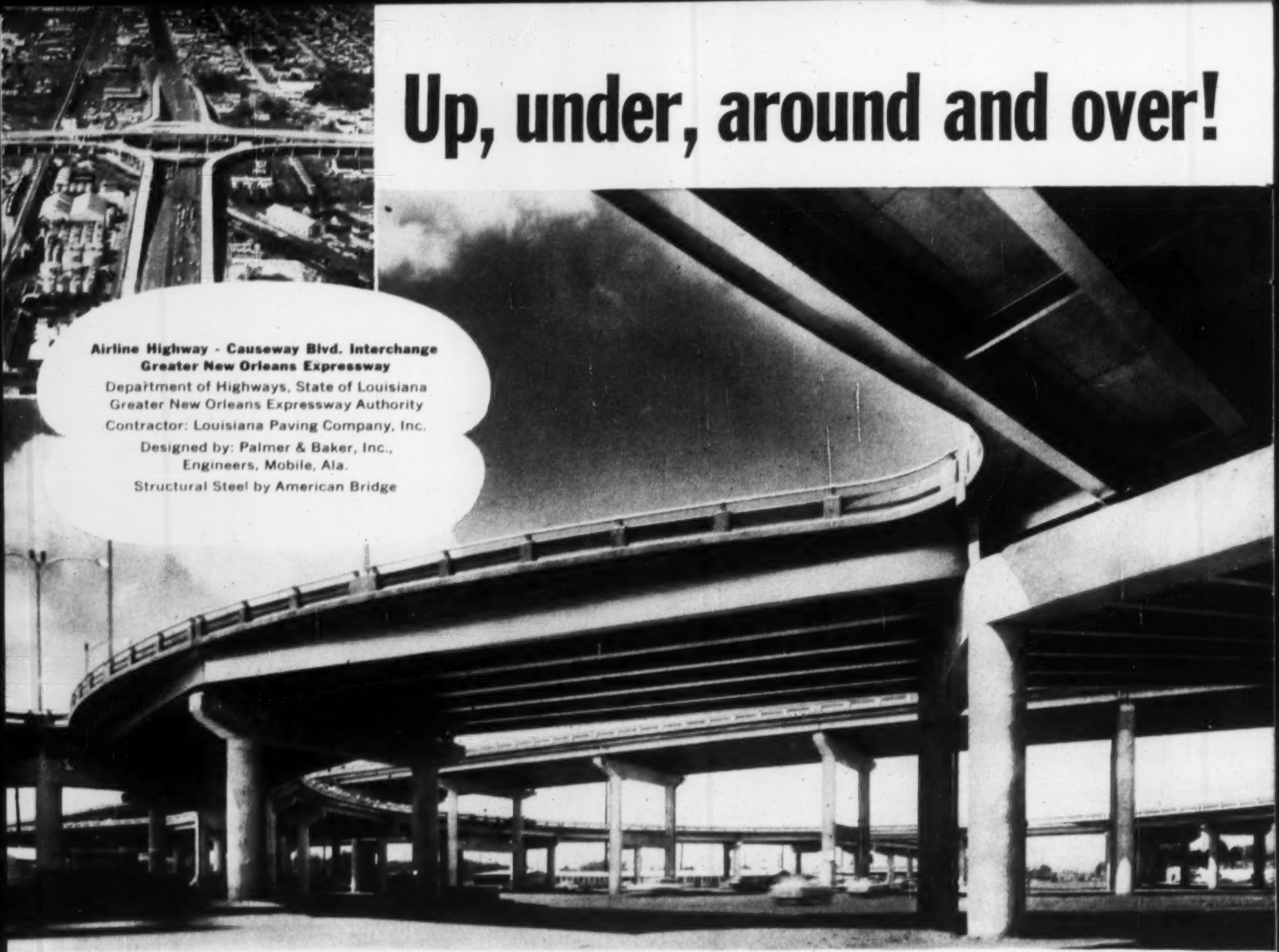
Up, under, around and over!



Airline Highway - Causeway Blvd. Interchange
Greater New Orleans Expressway
Department of Highways, State of Louisiana
Greater New Orleans Expressway Authority
Contractor: Louisiana Paving Company, Inc.
Designed by: Palmer & Baker, Inc., Engineers, Mobile, Ala.
Structural Steel by American Bridge

Interchange with elevated rotary roadway eliminates bottleneck at busy intersection . . . *speeds expressway traffic*

The bold new elevated rotary interchange shown above was recently opened on the Greater New Orleans Expressway. Designed to provide a maximum number of turning movements, it is already proving an efficient way to tie-in important intersecting highways with high-speed expressways . . . especially in built-up, congested areas.

Located at the busy intersection of Causeway Boulevard (the Expressway)—the only clear north-south route, and Airline Highway—a principal east-west route, this interesting circular interchange feeds traffic to and from these important arteries smoothly and with a minimum of interruptions.

The interchange embraces a 1,109′ long x 32′ wide circular elevated roadway having a 353′ centerline diameter. The Causeway Boulevard overpass over Airline Highway is 3,693′ long and carries two 28′ roadways plus median strip and walkways. Four 22′ ramps connect to Airline Highway, and four connect to the overpass, for a total of 7,590′ of ramp approaches. Altogether, interchange circle, overpass and ramps have about 2½ miles of roadway!

• • •

A total of 6,188 tons of structural steel went into the overpass, traffic circle and ramps. All of it was fabricated and erected by American Bridge.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.
Contracting Offices in: Ambridge · Atlanta · Baltimore · Birmingham · Boston · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Elmira
Gary · Houston · Los Angeles · Memphis · Minneapolis · New York · Orange, Texas · Philadelphia · Pittsburgh · Portland, Ore. · Roanoke
St. Louis · San Francisco · Trenton · United States Steel Export Company, New York

AMERICAN BRIDGE USS

UNITED STATES STEEL

. . . Maryland marina

(Continued from page 216)

1C	Eastern Shore Dredging Co., Branchville, Md., Wd Wd blkhd	$648,059
2A	Dorset Contr. Co., Inc., Wash., D.C.,Wd blkhd.	809,000
	Stl	778,004
2B	Chas, H. Tompkins Co., Wash., D.C., Wd	799,713
5	Wright Contr Co., Baltimore, Md., Wd	901,217
	Stl	866,777
6	Gunnell Const. Co., Inc., Wash., D.C., Stl	977,007
EE	Washington Suburban Sanitary Comm., Chief Engineer, Hyattsville, Md., Wd	611,906
	Stl	685,886

Bids: 8-12-57 Items	Unit	Quantity	Unit Prices 1 C	2
Admit building	ls		$26,730	$39,861
Bulkhead wood	sf	49,200	5.25	7.03
steel, alt	sf	49,200	......	6.40
Piles	lf	19,000	1.93	2.41
Paving, access road	sy	7,400	2.75	2.62
parking areas	sy	2,820	1.10	1.31
Sidewalks conc	sf	4,620	0.75	1.48
bitum	sf	13,350	0.44	0.37
Structure Pier #1	ls	job	14,920	22,287
Pier #3	ls	job	13,120	19,121
Pier #6	ls	job	13,200	19,175
Pier #8	ls	job	11,150	19,089
North Quay	ls	job	5,570	8,083
Water & Fire Fighting				
Pier # 1	ls	job	2,480	2,580
Pier #3	ls	job	2,110	2,620
Pier #6	ls	job	2,430	2,620
Pier #8	ls	job	2,530	2,600
North Quay	ls	job	2,420	2,220
Electric Power Pier #1	ls	job	3,900	4,348
Pier #3	ls	job	4,220	4,366
Pier #6	ls	job	3,880	4,307
Pier #8	ls	job	3,460	3,432
North Quay	ls	job	2,330	2,580
Flood Lights Pier #1	ls	job	1,070	1,026
Pier #3	ls	job	780	764
Pier #6	ls	job	780	735
Pier #8	ls	job	880	931
North Quay	ls	job	560	346
Power & flood Lights	ls	job	15,390	19,164
Elect contr pumps fuel dispen	ls	job	970	2,186
Sanitary sewer system	ls	job	19,830	15,900
On shore W M	ls	job	14,400	18,000
Storm drain	ls	job	3,740	9,368
Gas & oil piping	ls	job	2,070	2,000
Fill	cy	104,700	0.98	0.97
Topsoil sodding mulching	ls	job	22,390	26,207
Float system	ls	job	3,570	3,200
Guard rail parking	lf	1,230	3.80	5.00
highway	lf	1,460	2.80	2.50
Boat hoist	ls	job	7,750	12,000

Completion Date: September 1, 1958

Clear Creek Tunnel, Calif. Trinity River Diversion

This pressure tunnel is 17.5 ft in diameter and 10.8 miles long. It will cost just under $643 per lin ft. The $36,644,556 contract to joint venturers The Shea Co., Henry J. Kaiser Co., Morrison-Knudsen Co., Inc., Macco Corp., and Raymond Concrete Pile Co., bidding out of Alhambra, Calif. topped the engineers' estimate by 43.5% but was 3.3% under the second bid. L. B. Ackerman is project construction engineer for the Bureau of Reclamation. The job is 12 to 22 miles west of Redding, Calif. in Trinity and Shasta Counties.

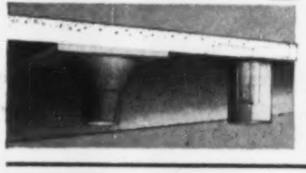
Construction will probably proceed from headings of an access shaft in addition to inlet and outlet headings. A concrete surge tank of the overflow type is part of this contract.

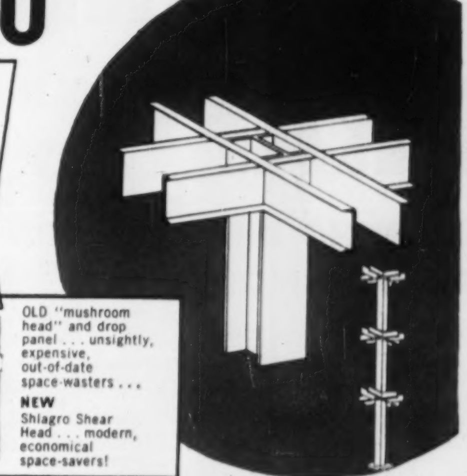
The Bureau will furnish rubber water stops, 40 fish screens, fish screen guides, embedded metal work and anchor bolts, non-embededd metal work including hatch and cover for pump chamber, ventilating screens, steel ladder and gratings, 2-t capacity revolving gantry

(Continued on page 222)

they'll wonder where the MUSHROOM went when you use

SHLAGRO SHEAR HEADS !





OLD "mushroom head" and drop panel . . . unsightly, expensive, out-of-date space-wasters . . .

NEW
Shlagro Shear Head . . . modern, economical space-savers!

SHEAR HEAD WITH SHLAGRO STEEL SQUARE COLUMN

Shlagro Shear Heads eliminate expensive mushroom heads and drop panels by allowing the steel to be completely imbedded in the floor slab, an important height-reducing advantage in single and multi-story buildings.

Shlagro Shear Heads are:

economical — substantial savings in form work . . . better utilization of floor space!

time-savers — the integrating of the Shlagro Shear Head and a Shlagro or rolled column allows multi-story column erection in advance of lower floor slab pouring.

modern finished appearance — clean, sharp lines . . . flat uninterrupted surfaces with Shlagro Shear Heads.

When using Shlagro Shear Heads, you obtain freedom of design for conventional, unusual and daring projects . . . You'll appreciate the outstanding planning flexibility made possible by Shlagro Shear Heads, used with a reinforced concrete column, a rolled structural steel column, or the Shlagro Steel Square Column.

SHEAR HEAD WITH ROLLED STEEL COLUMN

SHEAR HEAD WITH STUB FOR POURED CONCRETE COLUMN

SHLAGRO
SHEAR HEADS

SHLAGRO
STEEL PRODUCTS CORPORATION
SOMERVILLE MASS

Write today for your copy of the Shlagro Shear Heads Catalog, containing complete data plus tables of information to help you readily approximate what Shear heads to use in the construction of your floor-slab.

I am interested in the NEW SHLAGRO Shear Heads Catalog and other SHLAGRO product catalogs checked below:

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☐ #400 — EGG-SHELL STEEL PLATE ROOFS
☐ #500 — STOCK STEEL RIGID FRAMES
☐ #550 — STOCK STEEL VERTICAL MEMBER TRUSSES
☐ #600 — STOCK STEEL VERTICAL LIFT DOORS
☐ #650 — NO-SHELL PRE-CAST FIREPROOF REINFORCED CONCRETE COLUMNS
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SOMERVILLE, MASS.

"I proved it to myself...and you can, too...

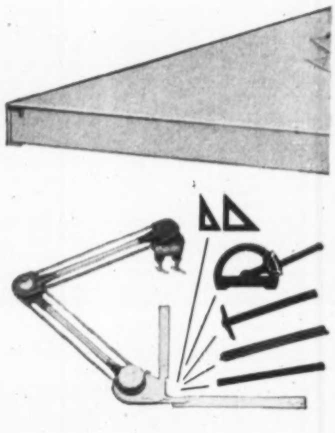
"BRUNING DRAFTERS DRAFTING JOBS BY 20

BRUNING DRAFTERS ADD MANPOWER TO THE DRAFTING ROOM — NOW WHEN YOU NEED IT MOST!

DRAFTSMEN! Prove it to yourself as have hundreds of skeptics who once frowned on using anything but conventional drafting tools like the T-square, triangle, and protractor. Bruning drafters actually speed drafting up to 40% on most jobs, up to 50% on some structural drawings . . . make your work far easier.

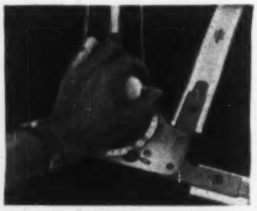
DEPARTMENT HEADS! The boom in production means pressure for more and more engineering drawings. With drafting space at a premium and experienced draftsmen hard to get, you couldn't find a faster or better way to add "manpower" than by boosting the output of your present draftsmen with modern, efficient Bruning drafters.

BRUNING DRAFTERS SPEED DRAFTING because they combine T-square, straightedge, triangle, protractor, and scales in *one* precision instrument. You eliminate the time and effort previously diverted to lifting, sliding, replacing, and reaching for these separate tools. Easily and quickly, you rotate, turn, and lift your Bruning drafter—all with the left hand. With fast fingertip control, you set and lock scales to any base line or angle. You accomplish everything that you can do with the conventional five basic instruments—only you do it much faster and much more accurately!

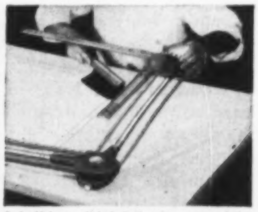


WHY BRUNING DRAFTERS ARE EASY TO OPERATE!

Bruning design permits complete 360 degree rotation about both the head and mast, making all parts of the board easily accessible—scales remain parallel to original angle setting. Patented Equipoise mechanism counteracts gravity on slopes up to 15°, literally "floats" your drafter into place without sag or "kickback." Exclusive Scalock device makes it easy to change scales, holds scales rigid while in use.



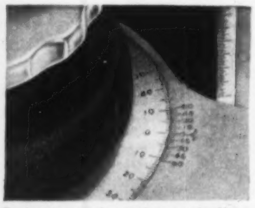
Automatic indexing stops at 15° intervals are engaged and released by just a press of the button on Bruning's unique Touch Control.



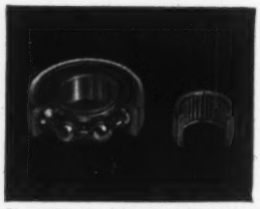
A ball-type joint between arms lets you lift your drafter over objects without unbalancing the machine or disturbing alignment of scales.

WHY BRUNING DRAFTERS ARE TOPS IN PRECISION AND DURABILITY!

Protractors have engine-divided graduations and double verniers reading to an accuracy of 5 minutes on most Standard models, to one minute on Civil Engineer models. A mathematically precise system of pulleys, machined to a tolerance of 0.0002", assures that drawing edges remain absolutely parallel to their original angle setting. Sturdy construction of the finest materials insures lasting accuracy and trouble-free operation.



Protractor and vernier graduations are set flush in the same plane to eliminate parallax error. Easy-to-read graduations are engine divided for accuracy.



Class #1 precision-ground, permanently lubricated ball bearings and frictionless needle bearings assure accuracy, effortless operation, and long life.

SPEED TO 40%!"

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EQUIPOISE
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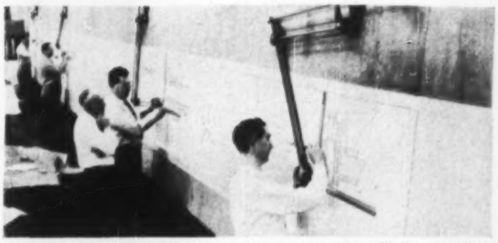
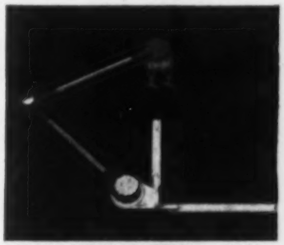
Exclusive Equipoise gravity compensator—finest on the market—permits use of drafter on inclined boards.

Standard protractor models—for mechanical, architectural, and structural draftsmen—are equipped with automatic indexing stops at 15° intervals. Civil Engineer protractor models—for civil, municipal, and utility engineers—have an azimuth scale, magnifier, and micrometer adjusting wheel. Arm lengths available to cover board areas from 36"x60" to 48"x96". Wide variety of scales. No extra charge for left handed models.



BRUNING TRACK DRAFTERS bring new space-saving efficiency and accuracy to firms that need extra-large drawings. Both single-arm and double-arm models offer automatic indexing, double verniers, and fast scale changes. Models are available to provide vertical coverage up to 84", unlimited horizontal coverage.

BRUNING COUNTERBALANCED DRAFTERS provide unusual speed, and accuracy in vertical drafting. Available with Standard or Civil Engineer head and same arm lengths as Equipoise drafters.



BRUNING DETAIL DRAFTERS are a lighter, more compact, and less expensive variation of larger Bruning machines. Ideal for smaller drawings and use in shops, schools, and in the field.

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Los Angeles 17, California

. . . Clear Creek Tunnel

(Continued from page 219)

crane, 10 slide gates and motor operated lifts, stems, stem guides, stands, motors and limit switches.

The contractor furnishes all other materials. Class A concrete must develop compressive strength of 3,000 psi.

Although the construction period is almost five years, no escalation provision is specified to cover future wage increases. Minimum rates set for starting the work range from $2.325 for common labor to $2.58 for semi-skilled and $3.00-3.50 for skilled workers.

The bidding included:

1C	The Shea Co., Henry J. Kaiser Co., Morrison-Knudson Co. Inc., Macco Corp., Raymond Concrete Pile Co., Alhambra, Calif	$38,644,556
2	T. E. Connolly Inc., Connolly Pacific Co., Grafe-Callahan Const. Co. & Floyd Shofner, San Francisco, Calif	37,882,385
4	S. A. Healy Co., Brown & Root Inc., J. A. Jones Const. Co., Trinity Constructors, White Plains, N. Y.	48,967,710
EE	Bu of Reclamation, Weaverville, Calif	25,549,569

Bids: 12-20-56			Unit Prices	
Items	Unit	Quantity	1C	2
Exc, open cut, at intake	cy	20,000	$4.00	$31.60
outlet	cy	35,000	2.00	31.60
for surge tank basin	cy	80,000	1.89	31.60
Surge tank basin fill,				
place	cy	50,000	1.62	2.00
compact	cy	40,000	1.05	2.00
compact cush undr lining	cy	1,700	2.84	10.00
Backfill about structures	cy	4,000	1.73	1.00
compact backfill	cy	150	7.70	6.00
Riprap	cy	200	15.20	5.00
Pit-run gravel bed	cy	100	7.00	5.00
Crushed-rock surf	cy	100	5.59	5.00
Exc for surge tank	cy	15,000	35.65	50.40
in tunnel	cy	675,000	29.55	30.32
for tun enlargement	cy	3,500	42.40	20.00
Drill feeler or pilot holes ahead of tun exc	lf	6,000	7.35	4.00
Permt stl tun supports f&i	lb	8,000,000	0.48	0.30
Permt timbering in tun f&e	Mbm	1,300	615.75	450.00
Tun roof support bolts f&i	lf	12,000	2.20	3.00
Conc in structures	cy	3,000	118.00	85.00
tunnel lining	cy	166,000	33.89	22.00
liner plate section	cy	2,000	39.05	60.00
surge tnk basn	cy	4,000	60.00	80.00
ling	cy	750	67.00	40.00
trim foundation	sy	6,000	1.33	10.00
Cement f&h	bbl	263,000	5.20	5.50
Stl reinf bars f&p	lb	2,500,000	0.18	0.16
hoop reinf, tun reaches f&p	lb	7,000,000	0.18	0.20
other tun reaches f&p	lb	5,000,000	0.18	0.115
Drill grout holes tun rock	lf	12,000	5.80	10.00
Pipe & fitgs, grtg tun rock f&p	lb	1,800	0.60	2.00
Pressure grtg, tun rock	cy	12,000	3.50	5.00
Hook up tun rock & shaft rock grout holes	ea	1,200	11.50	20.00
Elast filler matl in jnts				
½" f&p	sf	400	1.60	2.00
1" f&p	sf	65	2.40	3.00
Rubber waterstop,				
tp A 9" f&p	lf	420	5.80	8.00
tp B 6" p	lf	4,600	1.80	8.00
F matls & constrg grav drn,				
6" SP uncmntd jnts	lf	600	4.35	12.00
sand & gravel drns without SP	lf	2,400	2.90	10.00
SP cmntd jnts, 8" f&i	lf	150	4.40	15.00
Tunnel liner f&i	ls	job	332,979	450,000
Mtr driven pump unit f&i	ea	1	730.00	1,200
Fish screens i	ls	job	5,300	20,000
Guides & crane rail i	lb	36,000	0.16	0.30
Embedd metlwok & anch bolts i	lb	8,000	0.18	0.50
Nonembedded metlwok i	lb	5,000	0.16	0.40
Handrail f&i	lb	4,500	0.70	1.00
Drains f&i	ls	job	3,300	8,000
Fish screen gantry crane i	ls	job	2,200	5,000
Chain link fence f&e	lf	980	11.20	15.00
Slide gates, lifts, control cabinets & anch bolts i	ls	job	7,290	10,000
MP, fit, valves & hose f&i	ls	job	1,450	300.00
Elect met cond				
¾" & less f&i	lf	400	2.20	3.00
1½" f&i	lf	100	7.10	4.00
with prot ctng 1½" f&i	lf	30	7.40	6.00
Insul elect cndtrs & grndg sys f&i	lb	400	4.00	4.00
Electrical apparatus f&i	lb	80	24.00	5.00
Light fixtures f&i	ea	5	36.00	100.00

Time to Complete: 1,720 calendar days
Liquidated Damages: $1,250 per day

RR Relocation Tunnels for Oroville Dam, California

This 23 mi relocation of the Western Pacific Railroad around the Oroville Dam and Reservoir site requires two tunnels 4,410 and 8,830 ft long for single track operation to cost $8,499,235. This is part of California's Feather River Project and is under the Director of Water Resources, Sacramento. Contract to Peter Kiewit Sons' Co., San Francisco is on a low bid almost 19% under the second bidder.

The two tunnels are fully concrete lined, 18 ft wide by 24 ft above top of rail with an arch roof.

All materials are furnished by the contractor. The site is 20 mi from the nearest railhead.

Effective wage rates on the job include: carpenters $3.225 plus 10¢ health & welfare, common laborers $2.505 + 10¢, tractor operators $3.33 + 10¢ drillers $2.755 + 10¢, reinforcing steel workers $3.15 + 10¢ until Aug. 15, electricians $3.67 + 10¢ +1% pension fund +1¢/hr apprentice fund less 14¢ withheld for vacation fund.

The five bidders include:

1C	Peter Kiewit Sons' Co., San Francisco, Cal	$8,499,235
2	S. A. Healy Co., Brown & Root, Inc., White Plains, N. Y.	10,444,160
5	B. J. Ukropina, T. P. Polich, Steve Kral, Vinnell Co., Inc., Wunderlich Contr. Co., Alhambra, Cal	13,443,846

Bids: 5-15-57			Unit Prices	
Items	Unit	Quantity	1C	2
Access rd to tunnel portal	ls	job	$144,440	$50,000
Excavation, roadway	cy	10,000	6.00	2.00
structure	cy	9,600	7.00	2.00
ditch & channel	cy	500	5.00	3.00
Structure backfill	cy	4,600	4.50	1.50
Excavation, tunnel	cy	300,800	12.00	13.00
Feeler or pilot holes	lf	1,000	3.60	5.00
Line drilling	sf	900	2.90	2.00
Leveling course ip	cy	2,120	8.20	10.00
Conc, struct ip	cy	2,450	40.00	70.00
tunnel lining ip	cy	82,000	18.50	30.00
tunnel invert ip	cy	5,015	12.00	22.00
Met drains & weep pipes ip	lbs	215,000	0.40	0.75
Portland cement ip	bbl	135,000	4.00	7.00
Steel, reinf ip	lbs	7,361,000	0.12	0.13
Struct perm supports ip	lbs	3,120,000	0.30	0.30
Rock bolts ip	lf	70,000	2.00	2.50
Perm timber lagging ip	Mbm	500	170.00	500.00
Signal sys conduit, tun				
4 f&i	ls	job	40,000	50,000
5 f&i	ls	job	80,000	90,000
Lghtg, grndg & pwr sys & ventg sys conduit, tun				
4 f&i	ls	job	30,000	30,000
No. 5 f&i	ls	job	73,500	70,000
Misc iron & steel ip	lb	1,100	0.50	0.80
CMP 24" 10ga	lf	127	13.00	10.00

Completion Schedule: 500 working days

Spillway Chute, Big Sioux River, South Dakota

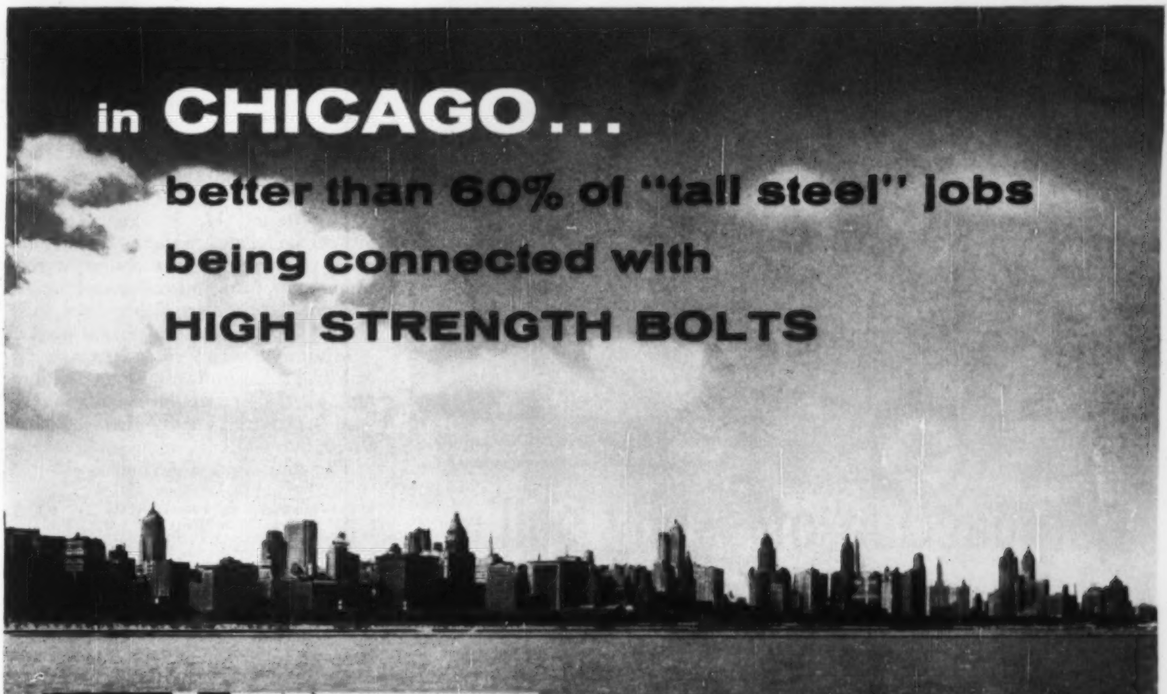
Part of this chute foundation in stilling basin area is in native quartite rock which requires blasting in an industrial area. Another complication for the contractor is the presence of high tension electric power lines which prevents use of equipment with booms in some areas. The contractor is Long Construction Co., Kansas City, Mo. at $618,028 for this flood control protection for

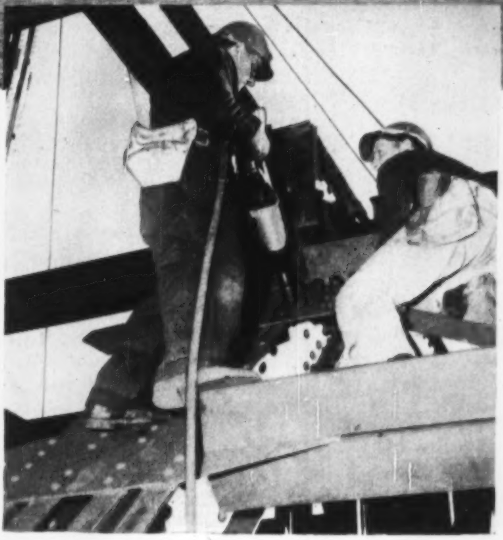
(Continued on Page 224)

BOLTED CONSTRUCTION IS "GOING UP" EVERYWHERE

in CHICAGO...

better than 60% of "tall steel" jobs being connected with HIGH STRENGTH BOLTS





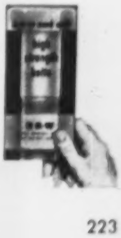
Major cities everywhere point up the phenomenal progress in erecting steel frames with high strength bolts. Report from Chicago shows that the bolts are replacing rivets in 60 to 70% of the new towering steel construction jobs.

Little wonder. Bolted connections benefit everybody. Constructors cut costs and save erection time, the ironworker finds them safer to install, the community is spared riveting noise, the owner gets a better structure.

RB&W...largest independent producer of high strength bolts for construction

Used in place of rivets, as approved by AISC, RB&W high tensile bolts become the strong points of a structural connection. Conforming to ASTM specification A325, they develop optimum shear and tensile strength in the connection for all types of loads. They're superior for dynamic loads, stay permanently tight where rivets loosen.

RB&W high strength bolts give erectors the quality they need, the easy assembly they want. Cleanly, uniformly threaded, they finger-tighten easily prior to wrench application.



Send for Bulletin HS-1 (as many as you need) which gives working information and helpful hints. Or see RB&W Catalog in Sweets Industrial Construction File. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

RB&W

112th year

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. **Additional sales offices at:** Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco. **Sales agents at:** Milwaukee; New Orleans; Denver, Fargo. **Distributors** from coast to coast.

The Bonnie Phosphates Chemical Plant • International Minerals & Chemical Corp.
Engineers & Constructors—The Rust Engineering Co.

Compaction of sandy soil by Vibroflotation®

saved $250,000 over the use of pilings, for building foundations in Florida.

The Bonnie Phosphates Chemical Plant of International Minerals & Chemical Corporation was built upon sand that was compacted by Vibroflotation.

In addition to savings estimated by the engineers at $250,000, Vibroflotation provided a rapid, effective solution to the problem of eliminating foundation settlement, even under exceptionally heavy dynamic loads.

Deep test pit cut into compacted area at Bonnie, Florida

Because of the excellent results of the first application in 1950, Vibroflotation was again used in 1954 and in 1956 for expansion of the same plant.

Over 3,000 Vibroflotation penetrations made in 5 acres for original plant. A 30% relative density of sand increased to a minimum of 70%.

Write for Booklet

Proven Applications
Deep Foundations • Dams
Bridges • Airports • Tunnels
Commercial Foundations
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VIBROFLOTATION FOUNDATION CO.
930 Fort Duquesne Boulevard
Pittsburgh 22, Pa.
ATlantic 1-2500

V-11

. . . Spillway chute, S. D.

(*Continued from page 222*)

Sioux Falls, S. Dak. The Corps of Engineers, Omaha, Nebraska District is the engineer.

The chute is 870 ft long, 72 ft wide with walls 8 ft high. The stilling basin walls are 31.5 ft high, crest elevation is 1,407.5, stilling basin elevation is 1,295.0 ft.

The owner, U. S. Engineers, furnishes aggregate, cement, reinforcing steel, vitrified, cast iron and reinforced concrete pipe and miscellaneous metals. Cement takes 4 to 6 bags per yard. AWWA cl C cast iron pipe is used.

Minimum wages include: crane operators $2.60, ironworkers on reinforcing $2.925, common labor $1.725, semi-skilled $1.85 and other skilled at $2.30.

The nine bidders included:

1C	Long Construction Co., Kansas City, Mo	$818,028
2	J. H. Beckman Co., Inc., Sioux Falls, S. Dak. & Guy H. James Const. Co., Okla City, Okla.	639,997
9	Sweetman Construction Co., Sioux Falls, S. Dak.	912,902
EE	Omaha Dist., Corps of Engineers, Dept of Army, Omaha, Neb. "without profit	629,971

Bids: 5-1-57 Items	Unit	Quantity	Unit Prices 1 C	2
Earthwork	ls	job	$75,000	72,114
Disposal of unsuit matl	cy	5,700	0.50	0.30
Excavation, rock	cy	3,250	5.00	3.75
Concrete	cy	11,100	25.00	23.00
Portland cement	bbl	13,900	4.25	5.60
Steel reinforcement	lb	915,900	0.14	0.14
Water-stop, vinyl plastic	lf	511	2.00	3.70
Sheet pile	sf	2,910	3.00	4.20
Frost blanket, grav filter	cy	6,350	4.00	8.50
Perforated pipe, 8"	lf	990	2.50	2.90
Vitrified clay pipe, 8"	lf	1,100	2.00	2.50
CI pipe, valves, fittings	ls	job	5,000	2,000
Manholes	ea	12	500.00	450.00
Lampholes	ea	12	200.00	210.00
Guard Rail	ls	job	5,000	7,431
Filter blanket, for riprap	cy	100	3.00	3.60
Dumped riprap	cy	240	2.50	5.00

Completion Schedule: 7-25-57 to 9-15-58
Liquidated Damages: $100 per calendar day

Mooring Basin Dredged at Lynn, Mass.

This $127,980 contract to Perini Corp., Marine Div., Framingham, Mass. is for a mooring basin 500 ft by 300 ft and an approach channel 140 ft wide and 750 ft long to provide a depth of 8 ft at MLW. The waterways division of the Massachusetts Department of Public Works, Boston, is doing the job. The work will take 120 calendar days. Minimum wages include: dredge captain $2.95 per hr, operator $2.75, craneman, $2.45, oiler $1.90, fireman $1.90, mate $1.73, deckhand and scowman $1.48 each.

Bidding on this job included:

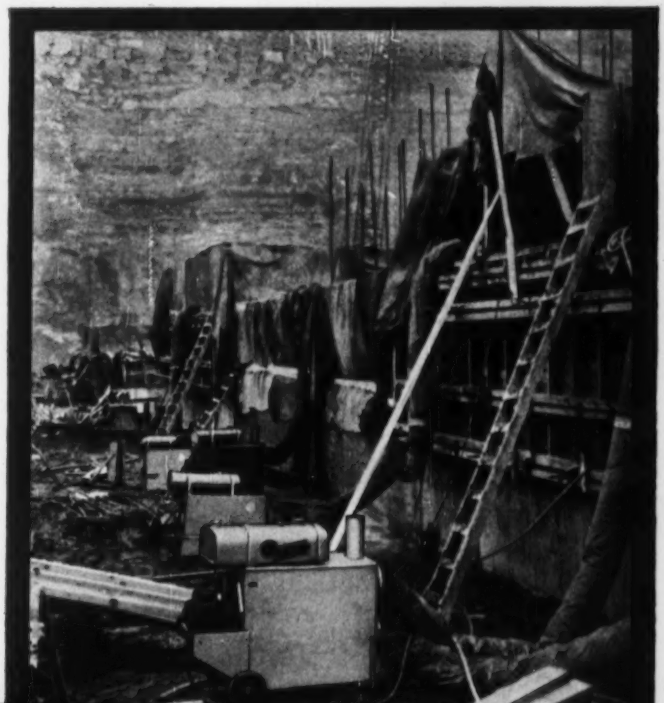
1C	Perini Corp, Marine Div, Framingham, Mass.	$127,950
2	New England Dredge & Dock Co. New Haven, Conn.	138,140
EE	Dept of Public Works, Commwlth of Mass, Boston	99,950

Bids: 8-13-57 Items	Unit	Quantity	Unit Prices 1 C	2
Material, dredge & disposes of	cy	57,000	$2.24	$2.42
Rock and/or boulders, remove	cy	10	30.00	20.00

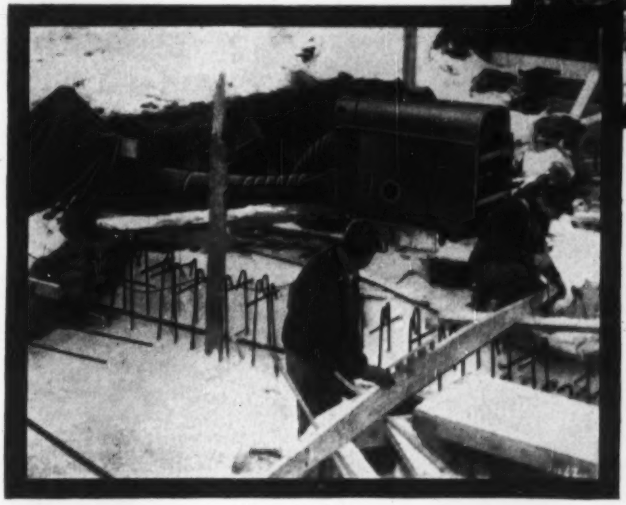
Completion Schedule: 120 calendar days.

(*Unit Prices continued on page 226*)

Curing 103,000 yards of concrete for giant Cochrane Dam . . .



or a 30-yard bridge foundation . . .



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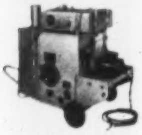
PORTABLE AIR HEATERS

everybody else does!

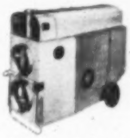
Whether it's portable heat for concrete pouring at Cochrane Dam—or heat for bridge building, earth-moving projects, highway or industrial construction . . . get *safe* heat from Herman Nelson Portable Heaters! They give you the safety of indirect firing, with smoke and fumes vented away from working area. Efficient combustion gives you more usable heat, and canvas ducts spot heat right where you need it.

Get set for winter now. See the complete line of Herman Nelson Portable Heaters at your dealer. Get his liberal offer on trade-ins, and start out with a brand-new Herman Nelson!



"Utility" Model

Interchangeable power plants — gasoline engine or electric motor. Gasoline or oil fired. Up to 425,000 BTU capacity.



"De Luxe" Model

Oil Fired. Electric motor powered. Up to 450,000 BTU capacity. The finest of all portable heaters—completely automatic.

"Thrifty" Model

Oil Fired. Electric motor powered. Easily portable, light weight, only 24" wide. Up to 165,000 BTU capacity. Low price!

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Portable Products Dept 210 • Louisville 8, Kentucky

Rush me complete literature on portable heaters. Also send your monthly Weather Forecast Chart, at no cost or obligation to me.

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COMPANY ____________________

ADDRESS ____________________

CITY ____________ ZONE ______ STATE ________

New York City's Water Supply Tunnels Cost from $311 to $457 per Lineal Foot

Average Costs—West & East Delaware Tunnels

Diameter 11′ 4″ — except 406 & 407 as noted

Contracts	Date	Length-lf	Structures	Contract Price	$/lf Tun
455+454	1957E	102,000	3 sh, 1 outlet	$43,904,554	$430.43
452+451	1955E	103,100	3 sh, 1 int chan	35,709,589	346.35
405+408	1949W	47,950	int chan, chamber superstruct	17,132,680	357.30

West Delaware Tunnel—44 miles

Cont No.	Bid Date				
455	4-23-57	60,000	2 shafts	26,241,750	437.36
454	4-23-57	42,000	1 sh	19,198,700 Bid	457.11 Bid
			1 outlet	17,662,804 CA*	420.54 CA*
453	9-25-56	26,400	1 shaft	11,771,580	445.89
452	10-25-55	60,000	2 sh	21,200,000 Bid	353.33 Bid
				20,352,092 CA*	339.20 CA*
451	10-25-55	43,100	int chan	16,007,805 Bid	371.41 Bid
			1 shaft	15,357,493 CA*	356.32 CA*

*after deduction by contr for award of both contracts.

East Delaware Tunnel—25 miles

	Awd Date				
405	7-27-49	20,200	int chan acc rd	8,513,505	421.46
406	7-27-49	43,560	1 shaft-14′φ	14,433,865	331.35 14′φ
407	7-27-49	40,350	1 shaft-14′φ	13,560,575	336.07 14′φ
408	7-27-49	27,750	portal φ 9′ 6″	8,619,175	310.60

Final Stage of West Delaware Tunnel

		Contr 454	Contr 455
1C	The West Delaware Tunnel Constructors, Roscoe, N. Y. (Johnson, Drake & Piper Inc., New York, N. Y., Winston Bros., Minneapolis, Minn., Tecon Corp., Dallas, Tex., The Conduit & Foundation Corp., Phila, Pa.)	$26,241,750	$19,198,700*
2	Frazier Davis Const. Co., St. Louis, Mo., Massman Const Co., Kansas City, Mo., S. J. Groves & Sons Co., Minneapolis, Minn. MacDonald Const. Co., St. Louis, Mo	26,350,175	17,803,775
4	Peter Kiewit Sons' Co., Inc., Omaha Nebr., Coker Constr Co., Inc., Omaha, Nebr., Perini Inc., Framingham, Mass., Morrison Knudsen Co., Inc., Boise, Idaho, Henry J. Kaiser Co., Oakland, Calif	32,420,936#	22,623,643#
5	MacLean-Grove, Brewster & Associates, N. Y.	33,955,150	no bid

*Less 8% if awarded both contracts #Less 1% if awarded both contracts

Bids: 4 23 57 Items	Unit	Contract 454—11.4 miles Quantity	Unit Prices 1 C	2	Unit	Contract 455—7.9 miles Quantity	Unit Prices 1 C	2
Borings	lf	1,000	$11.00	$7.50	lf	3,000	$11.00	$7.50
Sink shafts, line conc mas								
in earth	lf	39	3,500	2,800	lf	22	5,000	3,000
in rock 6″ to A line	lf	932	3,500	2,900	lf	308	5,000	3,200
8″ to A line	lf	568	3,600	3,000	lf	327	5,100	3,330
Exc tunnel, lin with conc mas								
6″ to A line	lf	58,200	274.00	279.00	lf	39,710	300.00	285.00
8″ to A line	lf	2,000	284.00	285.00	lf	2,000	316.00	300.00
Exc & conc mas, enlargements, shafts & tun	cy	150	100.00	40.00	cy	150	100.00	40.00
Prot coatings, cmt mortar	cy	5,000	35.00	40.00	cy	3,600	35.00	40.00
Roof bolting tun support	lb	1,750,000	0.30	0.32	lb	1,500,000	0.30	0.32
Steel struct support, shafts & tunnel	lb	40,000	0.75	0.60	lb	220,000	0.50	0.50
Drilling holes for roof bolts	lf	325,000	1.75	0.80	lf	250,000	1.75	0.80
Timbering in shfts & tun	mft	300	150.00	150.00	Mft	200	150.00	150.00
Pumping from shfts & tun	mfg	200,000	0.10	0.10	Mfg	100,000	0.10	0.10
Drill holes, grtg & misc	lf	100,000	1.25	1.50	lf	70,000	1.25	1.50
Steel pipes for grouting	lf	10,000	2.00	1.50	lf	7,500	2.00	1.50
Making conn for grouting	ea	4,500	10.00	5.00	ea	3,000	10.00	5.00
Sand for filters, grout, prot ctgs of cmt mortar	cy	8,000	7.00	5.00	cy	6,000	7.00	5.00
Mix & plac grout	cy	16,000	25.00	40.00	cy	11,000	25.00	40.00
Exc in open cut earth	cy	20,000	3.00	2.00	cy	38,000	2.50	2.00
rock	cy	200	7.00	20.00	cy	2,000	7.00	10.00
Refilling & embanking	cy	8,000	2.50	2.00	cy	5,000	2.50	2.00
Surface dressing & grassing	cy	8,000	4.00	3.00	cy	8,000	4.00	3.00
Timber & lumber in open cut	Mft	60	400.00	300.00	Mft	100	400.00	300.00
Conc mas in open cut	cy	600	100.00	75.00	cy	500	100.00	75.00
Rubble mas & paving	cy	250	30.00	50.00	cy	350	30.00	50.00
VP, ACP & CMP	lf	7,000	3.00	2.00	lf	6,500	3.00	2.00
Crushed stone & gravel	cy	250	14.00	7.50	cy	250	14.00	7.50
Portland cement	bbl	450,000	4.00	6.00	bbl	300,000	4.00	6.00
Steel, reinf	lb	50,000	0.25	0.20	lb	40,000	0.25	0.20
Misc metal work	lb	20,000	1.00	1.50	lb	18,000	1.00	1.50
Chlor & treat pumpage	mach mo	300	50.00	50.00	mach mo	300	50.00	50.00
Liq chlor & alum sulphate	lb	40,000	0.40	0.25	lb	50,000	0.40	0.25
Engr's offices & chlor houses	ls	job	100,000	90,000	ls	job	90,000	60,000
Sanitary services	ls	job	40,000	1,000	ls	job	40,000	1,000
Cleaning up	ls	job	15,000	5,000	ls	job	15,000	5,000

*mfg—million ft gal

Completion schedule: May 1957 to May 1961 Liquidated damages: $500 per day

Minimum Wage rates in Sullivan County, New York include:

Operating engineers		
shovels cranes—surface		$3.97½+20¢ fringe
tunnel & free air shaft		3.90+20¢
steel erection, surface		4.10+20¢
minor equipment, surface		3.50+20¢
Carpenters	surface	3.25+16¼¢
Electricians	surface	3.00+0

Ironworkers	surface	$3.75+22½¢
Truck drivers	surface	2.50-2.70+0
Labor		2.55+10¢
Blasters, surface		3.20+10¢
free air shaft & tunnel		3.25+7½¢
Drill runners, surface		2.80+10¢
free air shaft & tunnel		2.80+7½¢

These average tunnel prices illustrate how conditions differ, even on sections of the same tunnel, more than they illuminate cost trends. Another obstacle in detecting trends is the different system of bidding used on the East and West Tunnels.

The 1957 unit prices for contracts 454-5 shown here for the third and final stage of the West Delaware Tunnel continue the new system inaugurated by the Board of Water Supply in 1955 with contract 451 (ENR 11-3-55, p. 92, 12-22-55, p. 48). This combines excavation and lining in one unit which is priced per lineal foot of tunnel. Previously each was bid separately on a per cubic yard basis. Stanley M. Dore is chief engineer for the Board of Water Supply, City of New York.

Both 1957 contracts went to joint venturers West Delaware Constructors on their low bid on the 11.4 mile section of the West Delaware Tunnel, $26,241,750 and their next to low on the 7.9 mile section, $19,198,700, which became low by a hair when 8% was deducted as both sections were awarded to them.

The biggest single item in the bidding was excavation and lining tunnel six inches to A line. The contract bids ran $274 per lin ft of tunnel on the big section, $300 less 8% or $276 on the shorter. These average 8.5% higher than corresponding bid prices on 1955 contracts and 8.31% higher than contract prices. The ENR Construction Cost Index went up 5.25% between the two contract dates.

Sinking shafts in rock and lining with concrete six inches to "A" line ranges from $1,500 per lin ft of tunnel for contracts 451-2 to $3,500 for contracts 453-4 and $5,000 bid, $4,600 contract for 455. Contract 454 has 932 lin ft of shaft, over three times the amount on any other contract. Lining 8 in. to "A" line costs $50 per lin ft more on the first two contracts and $100 per ft more on the other three.

Roof bolting went under contract at 21 cents a pound on the first two contracts, at 40 cents on the middle one, 30 cents on the 1957 pair. Bolt holes, in the same order ran $1.50 per lin ft, $2.00 and $1.75.

Cement on the 1957 contracts was bid at $4 per bbl, at $5.75 on contract 453, $4.75 on 453 and 451. Reinforcing steel runs 25 cents per lb, 20 cents and 18 cents in the same order.

Excavation in open cut for earth runs $2.50 per cu yd in contract 455, $3.50 in contract 454, $1.50 in contract 453 and $1.40 in contracts 452 and 451.

Grout mixing and placing produced these contract prices: $25.00 per cu yd in the two 1957 contracts, $50.00 in contract 453 and $20.00 in each of the earlier contracts.

(Unit Prices continued on p. 228)

TOP PERFORMANCE LOADING TOPSOIL In Lemoyne, Pennsylvania, one of the 66 TRACTO-LOADERS owned by Pennsylvania Dept. of Highways gets heaped loads of topsoil with its Tip-Back Bucket. Dumps load in center of truck, too — no protruding wheels ahead of cowl to rob operator of valuable reach. Material is used to landscape cloverleaf near Harrisburg.

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66 TRACTOMOTIVE LOADERS

PENNSYLVANIA JOINS OTHER STATES THROUGHOUT THE COUNTRY THAT ARE NOW TRACTOLOADER® FLEET OWNERS

The Pennsylvania Department of Highways makes sure it invests the taxpayer's money wisely. It has high standards for equipment purchases . . . and Tractomotive TL-10, 1-yd TRACTO-LOADERS more than meet every requirement. Proof — a fleet of 66 ordered at one time!

Right now these versatile loaders are busy making the taxpayers happy. Strategically located in each county throughout Pennsylvania, the TL-10's load out a variety of materials to keep roads and shoulders in top shape. This winter, they will help keep traffic flowing — load cinders and chemicals for icy roads and remove snow.

And whenever there is inside loading . . . the TL-10 is the ideal machine with its short, 11-ft turning radius. Works where small loaders are normally used.

Make *your* investment a sound investment. Make it a TRACTO-LOADER — 5 models; ½ to 2 cu yd. See your Allis-Chalmers construction machinery dealer.

TRACTO — *a sure sign of modern design*

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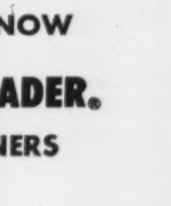

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Deerfield, Illinois

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☐ Have salesman call

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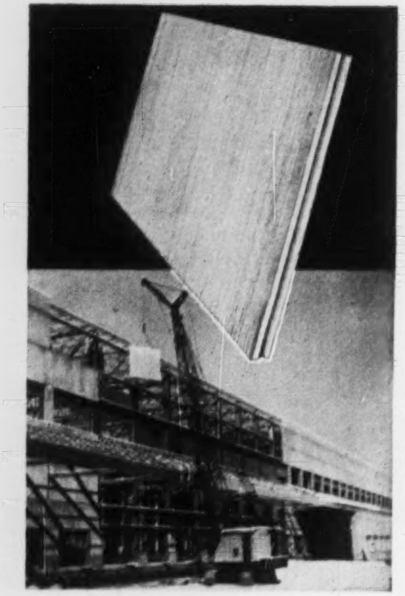

no winter weather slow-ups when you build with

MARIETTA

CONCRETE WALL PANELS

Construction moves ahead right on schedule, regardless of weather, when Marietta precast concrete wall panels are used for curtain walls.

Marietta insulated wall panels are only 5 inches thick . . . yet their insulation value is greater than a 12 inch masonry wall. This savings in wall thickness adds valuable floor space.

Panels come in a variety of standard size units and are equipped with metal inserts for bolting directly to structural framework or floor. Interlocking joint forms a weather-proof seal. No costly, time-consuming masonry work . . . no cold weather delays.

The broomed, or colorful exposed aggregate finishes create pleasing architectural effects for any structure. In winter building, or any other season, you'll realize major construction economies through use of Marietta precast wall panels.

Write for information and advice on the use of Marietta wall panels, structural units and custom prestressed components.

BRANCH OFFICES: Baltimore 21, Md.; Charlotte 6, N. C., Nashville, Tenn., Jamestown, N. Y.

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CONCRETE CORPORATION
MARIETTA, OHIO
New York Office: 501 Fifth Ave., N. Y., 17

Water Service Lines Bayou Section, Louisiana

Let in two contracts, one for the lines and the other for meters, boxes and yokes, this extension of service lines to Lafourche Parish will be served from water mains of Terrebonne Parish. The 2 in. cast iron line will have tie-ins at quarter mile intervals to the Terrebonne main. De Frates Assoc., Houma, La. is the consultant to Water Works District No. 1, Lockport, La. The main contract went to Koller Construction Co. also of Houma and the meters to Freishon & Belsom, New Orleans who placed the only complete bid.

Specifications call for class 150 cast iron pipe, slip joint, bell and spigot with single gasket seal.

Wages range from $1.25 for common labor to $1.75 for semi-skilled and $2.50 for skilled.

The bidding included:

1C	Koller Construction Co., Houma, La	$142,301
2	E. N. Murray, Contractor, Buena Vista, Ga	145,212
3	Clement Betpouey, Jr. & Co., New Orleans, La	147,679
EE	De Fraites Associates, Houma, La	175,000 T

Bids: 7-23-57 Items	Unit	Quantity	Unit Prices 1C	 2
CIPSJ, 6"	lf	3,550	$2.50	$2.50
fittings	lb	1,150	0.37	0.33
4" pipe	lf	4,739	1.63	1.90
fittings	lb	1,830	0.38	0.34
3" pipe	lf	5,668	1.39	1.60
fittings	lb	559	0.42	0.40
2" pipe	lf	86,977	0.92	0.96
fittings	lb	870	0.80	0.69
Protect ctd CI pipe, 2"	lf	200	1.26	1.50
Copper tubing, ¾"	lf	4,000	0.74	0.75
1"	lf	100	0.90	1.20
Gate valve, MJ & bx, 6"	ea	2	98.00	85.00
4"	ea	4	76.00	62.00
3"	ea	4	67.00	52.00
2"	ea	70	49.00	38.50
brass screw-end, 1½"	ea	3	34.00	20.00
2"	ea	2	40.00	25.00
1"	ea	5	28.00	17.00
Corporation stop, 1"	ea	5	16.00	7.50
¾"	ea	35	12.00	6.50
Serv saddle & stop comb, 2x¾"	ea	300	13.00	7.00
Meter bx & yoke, I only	ea	340	7.00	1.50
Shell street repair	lf	6,000	0.35	0.30
Stream xing, 6"x60'	ea	1	900.00	954.00
4"x60'	ea	2	760.00	820.00
3"x100'	ea	1	600.00	560.00
Bayou xing, 2"x100'	ea	31	320.00	391.00
Hiway xing, 6"x50'	ea	1	340.00	230.00
4"x40'	ea	2	290.00	160.00
Road xing, 3"x40'	ea	1	150.00	150.00
Hiway xing, 2"x50'	ea	19	120.00	135.00
Road xing, 2"x40'	ea	14	90.00	110.00
¾"x50'	ea	20	75.00	62.50

Completion Schedule: 150 calendar days
Liquidated damages: $100 per day
T incl lines, meters, services

1C	Freishon & Belsom, New Orleans, La	$2,118
	3 bids incomplete, sum of lowest of each	1,388

Items	Unit	Quantity	Unit Prices 1C	 Closest
Meters ⅝"x¾" oil seal reg	ea	335	$26.72	$26.30
⅝" S R alternate	ea	335	N B	26.00
¾" oil seal reg	ea	10	28.70	39.45
standard 1"	ea	5	58.48	47.84
1½"	ea	3	104.92	107.25
2"	ea	2	156.52	161.20
Meter box, art conc for ⅝"x¾" & ¾" meters	ea	345	4.21	4.00
1" meter	ea	5	5.06	7.00
Yokes, Ford No 110	ea	335	5.63	4.89
112	ea	20	11.58	10.84

Water Treatment and Main Extensions in Louisiana

These waterworks improvements for Logansport, La., include a 1.0 mgd treatment plant, pumping station with 190,000 gal steel ground storage (clear well) and main extensions.

Contract to the low bidder, J. B. Gill, Inc., Tulsa, Okla., at $197,022 is 0.6% under the engineer's estimate and 5.7% under the next bid.

The bids ran in these ratios:

	% of Total 1C	 2
Treatment plant	56.0	68.2
Pumping & storage	14.9	4.5
High pres. turbine pump	1.1	1.7
Extension of mains	28.0	25.6

Concrete is a 5-bag per cu yd mix and cast iron pipe is ASTM standard, class 150.

1C	J. B. Gill, Inc., Tulsa, Okla	$197,022
2	Wilks-Dake & Steed, Tyler, Tex	209,884
5	Bennings Constr. Co., New Orleans, La	247,938
EE	A. P. Noyes, Kilgore, Tex	200,000

Bids: 7-23-57 Items	Unit	Quantity	Unit Prices 1C	 2
Water treat plant, 1.0 MGD	ls	1	$110,047	$143,000
Raw water pumping station	ls	1	29,292	20,500
Pump, high press turbine, 700 GPM capacity	ls	1	2,165	3,500
CIP, cl 150, MJ, 10"	lf	64.0	7.64	5.00
8"	lf	2,950.0	5.03	3.50
6"	lf	400.0	4.19	2.50
2"	lf	9,900.0	1.95	1.15
flange, 8"	lf	16.0	15.37	5.00
CI fittings, cl D, MJ	t	2.5	761.60	460.00
flange	t	0.8	611.25	600.00
Valves, cl 150, MJ & bxes				
8"	ea	3.0	189.33	115.00
6"	ea	1.0	128.00	85.00
2"	ea	14.0	57.14	42.00
flange, 12"	ea	1.0	292.00	220.00
8"	ea	1.0	198.00	115.00
flange & bx, 6"	ea	1.0	138.00	85.00
Check valve, cl 150, Eddy F2954, 4"	ea	1.0	135.00	90.00
Propellor-tp meter with totalizer exten, incl conc meter pit 10"	ea	1.0	1,377	900.00
Water services, ¾"	ea	150.0	18.04	50.00
meters & boxes, ¾"	ea	150.0	48.61	33.00
Copper serv pipe, tp K, ¾"	lf	3,000.0	0.72	1.00
Pier concrete	cy	2.68	110.82	60.00
Repl asph pave	sy	35.0	13.71	3.00

Completion Schedule: 120 working days

Welded Steel Water Line in Oregon

Contract for installing 10,100 lin ft of this 16 in. welded steel pipe line with Dresser couplings went to Salem Sand &Gravel, Salem, Ore. at $22,606. Work is for the City of Forest Grove. Cornell, Howland, Hayes & Merryfield, Corvallis, are the engineers.

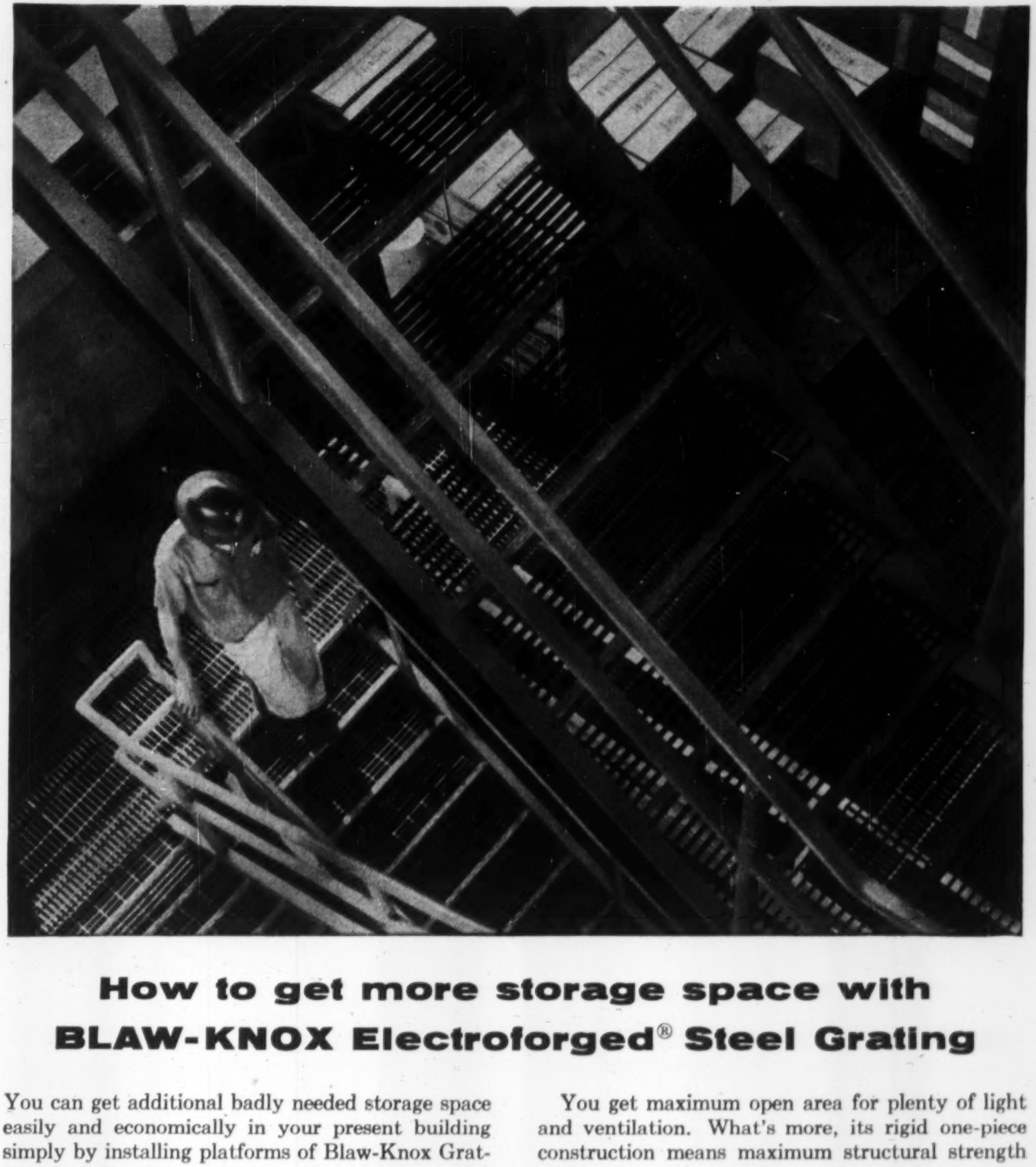
Ten bidders include:

1C	Salem Sand & Gravel, Salem, Oregon	$22,606
2	Henry Den Herder	23,065
10	P. W. Ferneding	44,067
EE	Cornell, Howland, Hayes & Merryfield, Corvallis, Oregon	33,216

Bids: 3-29-57 Items	Deep	Unit	Quantity	Unit Prices 1 C	 2
Exc trench & bf cl C	0'- 6'	lf	5,340	$0.69	$0.40
	6'- 8'	lf	2,825	0.86	0.50
	8'-10'	lf	400	1.00	0.55
	10'-12'	lf	20	1.25	1.00
cl D	0'- 6'	lf	1,800	1.73	2.45
	6'- 8'	lf	1,000	2.14	3.00
	8'-10'	lf	100	2.40	6.00
	10'-12'	lf	20	2.65	7.00
Pipe & fit 16",	i	lf	11,505	0.69	0.75
Air valves 1",	i	ea	1	85.00	70.00
Blow-off, 4"	i	ea	1	60.00	65.00
Gravel roadway, replace		cy	500	2.00	2.45
Asph pave, rem & repl		lf	155	2.00	3.00
Marker posts	i	ea	22	7.50	3.00
Cathod protect, conn P & C		lf	2,900	0.12	0.10
Mg anodes	i	ea	6	25.00	8.00
Control cable	lay	lf	11,775	0.03	0.02
junction box splices		ea	11	10.00	3.00

Completion time: 90 calendar days
Liquidated Damages: $50 per day

(*Unit Prices continued on page 230*)



How to get more storage space with BLAW-KNOX Electroforged® Steel Grating

You can get additional badly needed storage space easily and economically in your present building simply by installing platforms of Blaw-Knox Grating. It fits easily, neatly around pipes, beams and machinery without any alterations to your building.

Maintenance costs are slashed into the bargain. There's nothing to wear, nothing to patch. Blaw-Knox grating is self cleaning too. No sharp corners to clog up with dirt, and you'll find painting is easy since all surfaces are easily accessible.

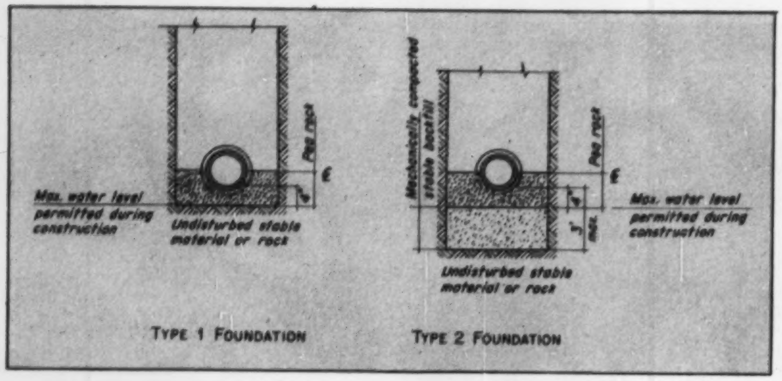
You get maximum open area for plenty of light and ventilation. What's more, its rigid one-piece construction means maximum structural strength and load bearing capacity.

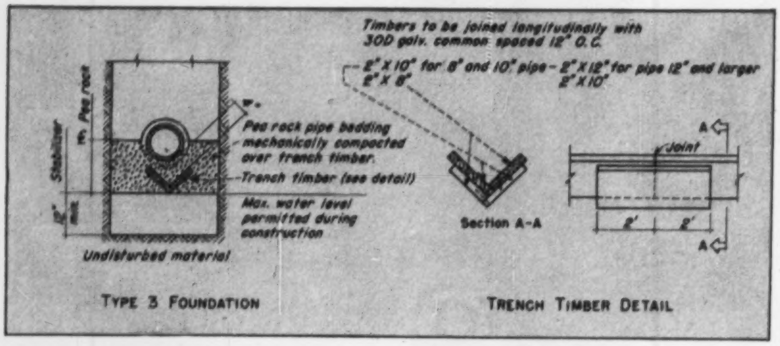
Blaw-Knox Electroforged Grating for walkways, stair treads and floors is fabricated to your specifications to meet your own operating requirements. Complete data on all types is contained in Bulletin 2527. Write for your copy today.

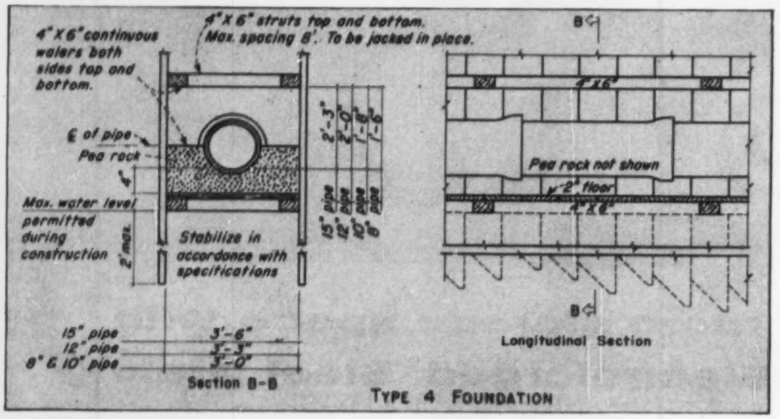
Grating and treads
Electroforged

BLAW-KNOX

BLAW-KNOX COMPANY
Blaw-Knox Equipment Division
Dept. A, Pittsburgh 38, Pa.


Max. water level
permitted during
construction
Undisturbed stable
material or rock
Pea rock
4"
℄
Mechanically compacted
stable backfill
3' max.
Undisturbed stable
material or rock
Max. water level
permitted during
construction
TYPE 1 FOUNDATION
TYPE 2 FOUNDATION


Timbers to be joined longitudinally with
30D galv. common spaced 12" O.C.
2" X 10" for 8" and 10" pipe - 2" X 12" for pipe 12" and larger
2" X 8"
2" X 10"
Pea rock
Stabilizer
Pea rock pipe bedding
mechanically compacted
over trench timber.
Trench timber (see detail)
Max. water level
permitted during
construction
12" min.
Undisturbed material
Section A-A
A
Joint
2'
2'
A
TYPE 3 FOUNDATION
TRENCH TIMBER DETAIL


4" X 6" continuous
walers both
sides top and
bottom.
4" X 6" struts top and bottom.
Max. spacing 8'. To be jacked in place.
℄ of pipe
Pea rock
Max. water level
permitted during
construction
2' max.
Stabilize in
accordance with
specifications
2'-3"
2'-0"
1'-8"
1'-6"
15" pipe
12" pipe
10" pipe
8" pipe
15" pipe
12" pipe
8" & 10" pipe
3'-6"
3'-3"
3'-0"
Section B-B
B
4" X 6"
Pea rock not shown
2" floor
4" X 6"
B
Longitudinal Section
TYPE 4 FOUNDATION

THE SEWER PRICES SHOWN BELOW by size of pipe and depth of cut are based on Type 1 Foundations as shown above. Where Types 2, 3 and 4 are needed, the amounts are shown which must be added to the base bid.

Sewers, Air Lifts on Complex Florida Job

This extremely difficult, $1,431,027 sanitary sewer project is in a section of Ft. Lauderdale that is solidly built up with luxury homes. Each street is a long island separated from the main boulevard by a canal. A system of 23 pneumatic ejectors operating from a central air compressor station will lift the sewage from each island through a force main to an interceptor sewer to be built in the boulevard. This sewer delivers to a central pumping station (not part of this contract) which pumps to the treatment plant. Both soil and water conditions are bad for sewer construction, further difficulties that are reflected in the bid prices that follow. E. L. Patterson is city engineer for Ft. Lauderdale and Philpott, Ross & Saarinen, Ft. Lauderdale are the consulting engineers.

Gravity sewers total 54,000 lin ft and air and force mains add up to 69,000 lin ft. The contract price, bid by Bumby & Stimpson, Inc., Orlando, Fla. is 3% under the engineer's estimate and 3½% under the second of five bidders.

The contractor is required to furnish all materials.

Cast iron pipe is class 150 B & S. Wages range from $1.25 common labor to $3.25 for skilled.

The bidding included:

1C	Bumby & Stimpson, Inc., Orlando, Fla.	$1,431,027
2	Thomas D. Nolan, Miami, Fla.	1,485,125
5	Marbaugh Constr Co., Ft. Lauderdale, Fla.	1,885,724
EE	Philpott, Ross & Saarinen, Engrs, Ft. Lauderdale	1,475,625

Bids: 7-26-57 Items	Unit	Quantity	Unit Prices 1C	2
VCP, tp 1, fdn				
8", 0-4' cut f&i	lf	8,600	$8.95	$6.20
4-6' cut	lf	27,600	9.25	7.20
6-8' cut	lf	14,600	9.80	8.40
8-10' cut	lf	500	10.50	10.60
10", 0-4' cut	lf	300	9.55	7.10
4-6' cut	lf	100	9.85	8.20
6-8' cut	lf	100	10.40	9.30
12", 0-4' cut	lf	50	9.95	7.80
4-6' cut	lf	50	10.25	8.90
6-8' cut	lf	400	10.80	10.70
15", 0-4' cut	lf	800	11.50	9.60
4-6' cut	lf	600	11.75	10.60
CIP, tp 1, fdn, 8" f&i	lf	500	12.40	10.00
18"	lf	150	22.00	21.00
Add for tp 2 fdn	lf	3,200	1.00	2.00
for tp 3 fdn, treat timber	lf	30,000	2.10	3.60
untreated	lf	12,000	1.70	3.40
for tp 4 fdn	lf	6,000	10.00	21.50
Lateral connect, all cuts,				
tp A f&i	ea	930	12.00	15.00
tp B 6" single wye br	ea	150	20.00	65.00
6" double	ea	90	32.00	75.00
Lateral, all cuts, VCP,				
6" f&i	lf	30,500	3.00	3.00
MH & appurt, tp 1 fdn std &				
tp B, 0-4' cut f&i	ea	73	153.00	200.00
4-6' cut	ea	87	176.00	260.00
6-8' cut	ea	48	227.00	320.00
8-10' cut	ea	3	293.00	400.00
tp A, 4-6' cut	ea	1	261.00	300.00
6-8' cut	ea	1	312.00	400.00
8-10' cut	ea	1	384.00	500.00
Add for tp 2 fdn	ea	10	100.00	140.00
for tp 3 fdn, treat timber	ea	128	10.00	45.00
untreated	ea	25	10.00	43.00
for tp 4 fdn	ea	25	35.00	200.00
Air & force mains				
1½" f&i	lf	20,000	3.65	1.85
2"	lf	7,900	3.90	2.15
3"	lf	800	4.65	2.60
4"	lf	19,500	4.40	3.00
6"	lf	8,400	5.20	4.70
8"	lf	900	6.20	5.90
12"	lf	5,900	8.40	8.90
12" flex joint	lf	300	40.50	60.00
14"	lf	5,500	9.10	9.25
CI fittings f&i	t	10	523.00	600.00
Plug valves & CI boxes, all cuts, brnz curb stop,				
¾" f&i	ea	8	14.00	17.00
1½"	ea	19	35.00	31.00
2"	ea	9	53.00	40.00
3"	ea	2	83.00	90.00
4"	ea	12	103.00	85.00
6"	ea	8	150.00	145.00
8"	ea	1	317.00	200.00
12"	ea	2	347.00	360.00
14"	ea	2	833.00	860.00
Air valves buried mains				
MH & appurt f&i	ea	3	390.00	550.00
on bridge crossings	ea	8	175.00	350.00
Air main moisture accum &				
appurt f&i	ea	47	60.00	60.00
Lift sta & appurt, D-1 f&i	ls	job	8,209	11,600
D-2	ls	job	19,947	23,350
D-3	ls	job	8,315	11,600
D-4	ls	job	8,367	11,600
D-5	ls	job	8,231	11,600
D-6	ls	job	8,309	11,600
D-7	ls	job	8,586	11,800
D-8	ls	job	8,308	11,600
D-9	ls	job	8,333	11,800
D-10	ls	job	28,665	24,550
D-11	ls	job	27,219	24,900
D-12	ls	job	10,131	11,800
D-13	ls	job	9,249	11,600
D-14	ls	job	8,560	11,600
D-16	ls	job	10,608	12,400
D-17	ls	job	9,237	11,600
D-18	ls	job	8,996	11,600
D-19	ls	job	8,928	11,800
D-20	ls	job	8,569	12,400
D-21	ls	job	8,861	11,600
D-22	ls	job	8,333	11,800
D-23	ls	job	8,685	11,800
Extra excavation	cy	100	3.00	5.00
cl C concrete	cy	50	45.00	60.00

Completion Schedule: 365 calendar days
Liquidated Damages: $100 per calendar day

(*Unit Prices continued on page 233*)

Front view of hangar. Designed by Burns and McDonnell, Kansas City, Ammann and Whitney, Consulting Engineers, New York City. Contractors: MacDonald-Creighton, St. Louis and Nashville.

HUGE NEW HANGAR AT KANSAS CITY AIRPORT

OUTSTANDING EXAMPLE OF HIGH-STRENGTH CABLE SUSPENDED ROOF

High-strength cable suspension of roofs is more and more being used wherever great expanses of column-free space are required.

One of the most dramatic examples is the new TWA hangar at Kansas City's Mid-Continental International Airport.

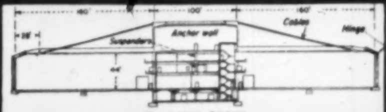
The supporting cables—supplied by Roebling—are anchored in 30 ft. deep concrete walls which span between the building columns at 30 ft. intervals. Each roof is 150 ft. wide and 818 ft. long, plus a ten-foot door overhang along its entire length.

This new application is further proof that the economy of axially stressed members in general, and high-strength wire tension members in particular, is not only practical but the valid solution for structures such as truck and bus terminals, sports arenas and gymnasiums.

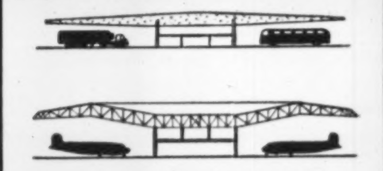
Roebling's Bridge Department Technical Service always is available for advice and creative design assistance on applications of wire members to physical structures. We invite inquiries about any project on which we might be of help. Write Bridge Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

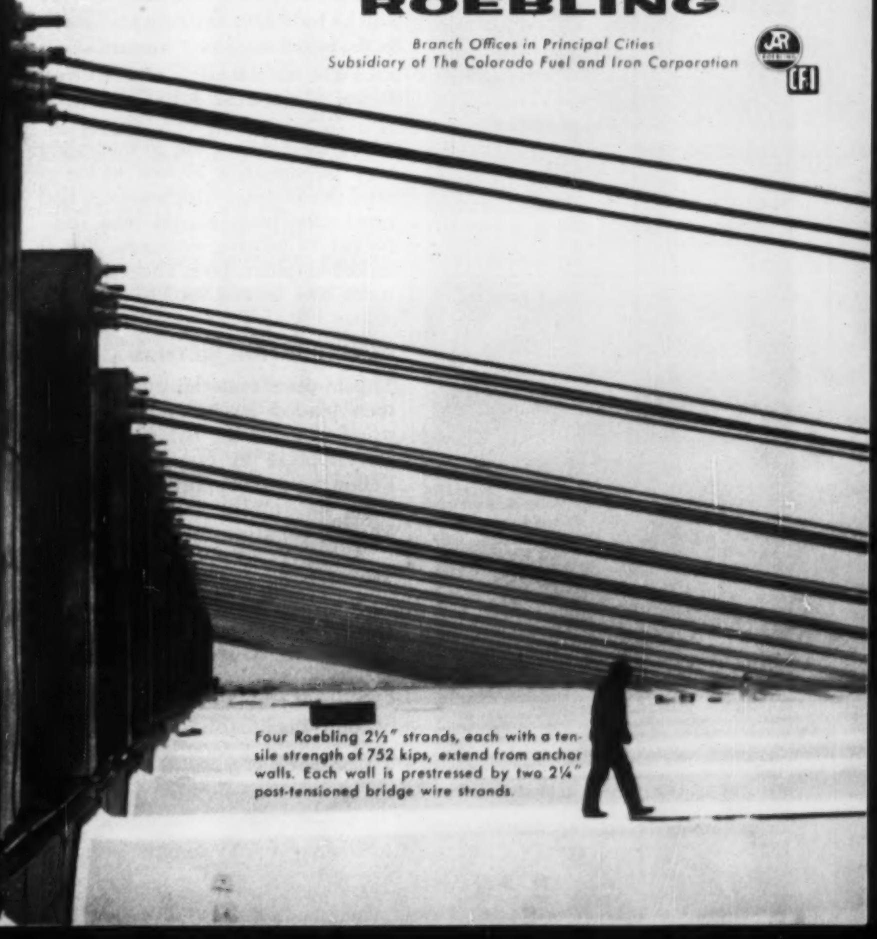
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



TRANSVERSE SECTION



Shown here are two examples of the versatility of the use of wire in structures. 1. A prestressed concrete bus/truck terminal. 2. The "gull-wing" type of suspended roof, employing a combined truss and cable system.



Four Roebling 2½" strands, each with a tensile strength of 752 kips, extend from anchor walls. Each wall is prestressed by two 2¼" post-tensioned bridge wire strands.

ADEQUATE SHOULDERS: Key to greater highway safety and service

BITUMULS® DM-1 is applied by distributor.

BITUMULS Base Stabilization of Shoulders on New Jersey Route S-41

FIRST PULVI-MIXER follows closely behind distributor.

PNEUMATIC ROLLERS in tandem on initial compaction.

MC-1 CUTBACK PRIME applied ahead of final seal.

● **Typical of the speed and ease with which new safety and service can be built into existing highways is the work done last August along an eight mile stretch of Highway Route S-41, near Ellisburg, N. J.**

Along each side of the 20 foot, rigid type pavement, a 10 foot width of sand-gravel base, 4 inches deep, had previously been placed and compacted to provide drainage. But it lacked stability, both under moving traffic and parked vehicles.

CONSTRUCTION METHOD

This in-place material was scarified, then bladed level. Over the loose scarified material, Bitumuls DM-1 was applied in two applications. Following each application, the material was mixed with two Pulvi-Mixers operating in tandem.

After mixing, the material was cut back to an even sub-grade line, then re-spread uniformly over the full 10 foot width. During blading and spreading, the mix had aerated sufficiently to allow immediate compaction. Pneumatic-tire rollers were used for initial compaction, with a final pass by tandem steel-wheel rollers.

This stabilized base was allowed to cure for one week, then surfacing proceeded as follows:

> MC-1 cutback prime applied at the rate of 0.25 gal. per sq. yd. 3/8″ traprock applied over prime at the rate of 25 lbs. per sq. yd. Bitumuls RS-2 applied at the rate of 0.25 gal. per sq. yd. 3/8″ traprock again applied at the rate of 25 lbs. per sq. yd.

The shoulders were then thoroughly rolled.

In addition to holding costs to a minimum by making use of in-place material, Bitumuls Base Stabilization provides a fast, simple method of extending the service and safety of existing highways. *Full details on this method of shoulder construction are available from our office nearest you.*

American Bitumuls & Asphalt Company

200 Bush St., San Francisco 20, Calif. Perth Amboy, N.J.
Baltimore 3, Md. St. Louis 17, Mo. Cincinnati 38, Ohio
Mobile, Ala. San Juan 23, P.R. Tucson, Ariz.
Inglewood, Calif. Oakland 1, Calif. Portland 7, Ore.

Sanitary Sewers in Flat Built-Up Area, New York

Unusually difficult site conditions complicate this complete sanitary sewer system for Wynantskill, a community of 3,000 near Troy, New York. The 15 in. outfall will connect to the Troy system. Harrison & Mero, Troy, are consulting engineers.

Most of the village is dead flat, requiring shallow trenches at the start and deep cuts near the outfall. Every road in the village is paved and property is highly developed, thus a high cost to replace lawns, curbs, sidewalks, pavement, driveways. A double inverted siphon is used to cross Wynantskill Creek, a stream about 30 ft wide. Ground water level is high through most of the area. With no public water supply system about 80% of the wells showed pollution in tests by Rensselaer County Health Department.

The contract to Delaney-Dugan, Latham, N. Y. requires moving 2,000 yards of rock with a maximum cut of 15 ft, average 6 ft 6 in.

The John DiGiulio, Albany, N. Y. contract for $350,230 was the low of six bids, 6% under the second bid and just over 1% below the engineer's estimate.

The contractors furnish all materials. Class A concrete is 1:1½:3 to test at 4,000 lbs and class B is 1:2:3½ to test at 3,500 lbs.

Wages prevailing on the job include: bricklayers $3.50, shovel operators $3.30, other skilled labor $3.00, semiskilled $2.475 and common labor $2.325.

Bidding included:

1	Geo. Wertime, Cohoes, N. Y. informal-out	$65,307
2C	Delaney-Dugan, Latham, N. Y	67,839
6	San Marco, Hartsdale, N. Y	125,079
EE	Harrison and Mero, Consulting Engineers, Troy, N. Y.	60,000

Bids: 6-19-57 Items	Unit	Quantity	Unit Prices 1	 2C
Exc, f&i VTP 15", 0' to 7'	lf	3,275	$5.20	$6.50
7' to 9'	lf	1,265	6.00	5.85
9' to 11'	lf	710	7.00	7.15
11' to 13'	lf	510	9.00	9.70
13' to 15'	lf	40	12.00	9.60
VTT or Y branch 15"x6"	ea	20	24.00	11.50
15"x8"	ea	1	28.00	15.00
VT 30° bends, 6"	ea	12	7.00	4.00
VT house laterals 6"	lf	100	6.70	4.50
VT clay stoppers 6"	ea	20	1.50	1.00
VT vertical risers 6"	lf	8	10.00	10.00
VT PES 15'	lf	140	8.15	1.75
Manholes, 0' to 7' deep	ea	13	250.00	210.00
7' to 9'	ea	5	300.00	225.00
9' to 11'	ea	2	350.00	300.00
11' to 13'	ea	3	375.00	400.00
Connect to City MH f&i	ea	1	100.00	50.00
MH-sta57 & 59 f&i	ea	1	100.00	25.00
exist 8" sewer to MH, #1	ea	1	100.00	100.00
#2	ea	1	100.00	300.00
New conc MH-box culv f&i	ea	1	300.00	500.00
Rebld retain wall, 24" strm sewer	ea	1	400.00	1,000
Conc cradle f&i	lf	110	5.00	1.00
Exc rock by blasting	cy	900	10.00	10.00
by air hammers	cy	20	25.00	30.00
Sheeting & bracing lip	bf	2,000	0.25	0.25
Gravel, run of bank	cy	150	1.25	2.00
Replace grav rds & drvwys	lf	620	2.00	1.00
asph pave	lf	40	4.00	5.00
blacktop rds & drvwys	lf	260	3.00	2.00
conc pavements	lf	200	4.50	10.00
sidewalks	lf	1,310	3.65	4.00
granite curbing	lf	30	7.00	6.00
lawns	lf	165	10.00	2.00

Completion Schedule: 8-21-57 to 1-15-58

1C	John DiGiulio, Albany, N. Y.	$350,230
2	Callanan Rd Improvement, So Bethlehem, N. Y.	372,396
4	San Marco Const. Corp., Hartsdale, N. Y.	525,339
EE	Harrison and Mero, Consulting Engineers, Troy, N. Y.	355,000

Bids: 6-19-57 Items	Unit	Quantity	Unit Prices 1C	 2
Exc, f&i, VTP				
8", 0' to 7' deep	lf	34,560	$3.00	$2.75
7' to 9'	lf	8,350	3.00	3.60
9' to 11'	lf	3,240	4.00	4.15
11' to 13'	lf	350	5.00	6.75
10", 0' to 7'	lf	4,200	4.00	3.25
7' to 9'	lf	1,330	4.25	4.10
9' to 11'	lf	280	4.75	4.65
11' to 13'	lf	120	5.50	7.45
12", 0' to 7'	lf	1,100	4.00	3.70
7' to 9'	lf	380	5.00	4.55
ACP 8", 0' to 7'	lf	1,360	4.00	3.70
7' to 9'	lf	250	4.50	4.60
9' to 11'	lf	70	5.00	5.15
10", 0' to 7'	lf	5	5.00	4.30
7' to 9'	lf	525	5.50	5.15
9' to 11'	lf	40	6.00	5.70
12", 0' to 7'	lf	660	5.50	5.15
VT or AC latls compl, 6"	lf	11,800	2.75	3.50
Manholes, 0' to 7' deep	ea	166	250.00	240.00
7' to 9'	ea	48	300.00	285.00
9' to 11'	ea	16	350.00	325.00
11' to 13'	ea	1	500.00	350.00
VTPES compl, 8"	lf	300	4.00	0.50
8"	lf	200	4.50	0.75
12"	lf	300	5.50	1.25
VT T or Y branches compl 6"	ea	620	6.00	3.00
VT 30° bends compl, 6"	ea	200	4.00	3.00
VT clay stoppers compl, 6"	ea	620	0.40	1.80
VT vert risers compl, 6"	lf	120	3.00	3.60
AC branch connec compl	ea	40	15.00	18.00
Excav, stream xing compl				
10'-10"	ea	1	200.00	500.00
12'-8"	ea	1	300.00	750.00
27'-8"	ea	1	500.00	1,000
rock blasting	cy	100	10.00	10.00
air hammers	cy	100	15.00	30.00
Sheeting & bracing lip	Mbm	15	150.00	200.00
Run of bank gravel	cy	1,100	1.50	1.25
Concrete cradle	lf	500	3.00	1.25
Gravel roads & driveways	lf	14,265	0.50	0.50
Shoulders on NY S rds	lf	1,650	1.00	0.80
Surf treat pave	lf	21,164	0.50	0.80
Blacktop Town rds & drvwys	lf	3,782	0.75	1.75
Conc asph state roads	lf	130	1.00	9.00
NYS pavements	lf	50	10.00	10.00
Blacktop, Brookside Ave	lf	215	1.00	1.75
Concrete sidewalk	lf	1,753	3.00	3.50
Lawns	lf	2,130	0.30	2.40
Slag driveways	lf	1,228	1.00	0.55
Concrete steps	ea	1	500.00	750.00
Catch basins	ea	2	300.00	225.00
Remov trees, 10-16"	ea	2	200.00	115.00
17-24"	ea	5	200.00	175.00
25-36"	ea	4	250.00	225.00
37-48"	ea	1	300.00	275.00
stumps 26"	ea	1	100.00	120.00
40"	ea	1	150.00	150.00
Inverted siphon	ea	1	1,000	11,000
Culverts, exten 18"	ea	2	500.00	250.00
& headwalls 8", replace	ea	1	500.00	200.00
Replace headwall, 16" Culvert	ea	1	300.00	250.00

Completion Schedule: 8-12-57 to 10-15-58

Coney Island Sewage Plant Outfall Let in New York

The contract for a $2,971,053 outfall, awarded to Spearin, Preston & Burrows, Inc., New York, ran 14½% over the engineer's estimate but almost 7% under the next bidder. This is a 90 in. reinforced concrete pipe outfall, 9,250 ft long, for the Department of Public Works, City of New York, Frederick H. Zurmuhlen, Commissioner. Greeley & Hansen, Chicago, are the consultants.

This is an addition to the existing 72 in. outfall and Contract 1 in the third stage of the Coney Island Pollution Control Project. The two outfalls will pass 220 mgd, twice the design flow of the plant extension.

The land section of the 90 in. outfall is 2,030 ft long with an average depth of 20 in. One 110 ft section will have to be jacked under the city's Belt Parkway. The water portion is 7,220 ft long at an average water depth of 28 ft. A

(Continued on page 234)

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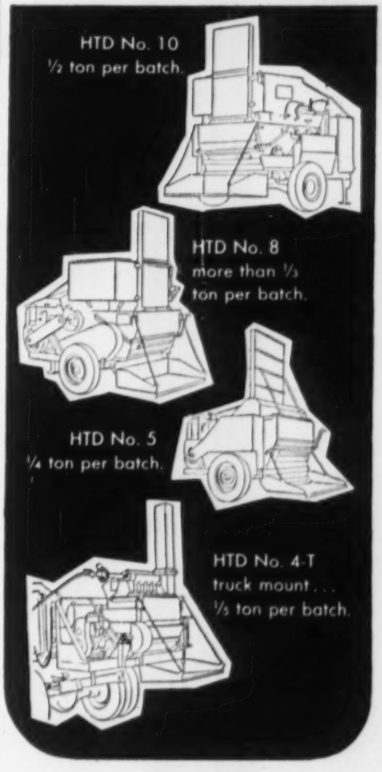

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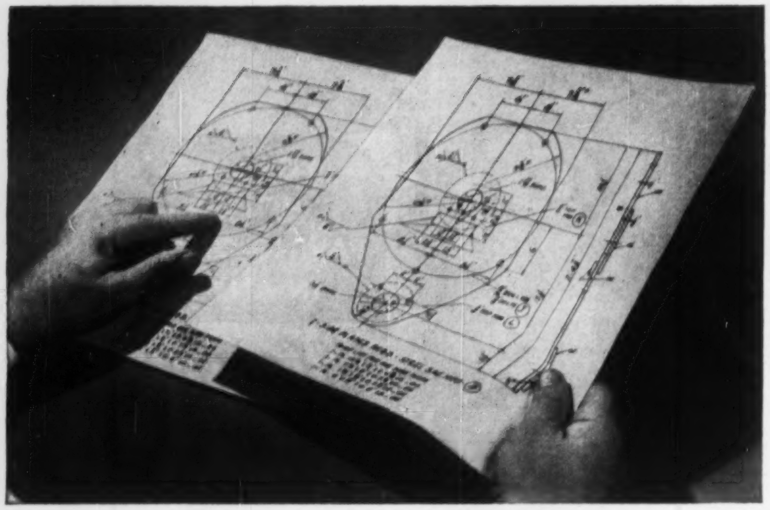


Even a printmaking expert cannot look at these two prints and tell which original drawing was made on Phantom Ruled Blutex. Still, there were hours of difference in drafting time required to make the two identical drawings from which these prints came. Write today for a free sample of Phantom Ruled Blutex and see the proof for yourself.

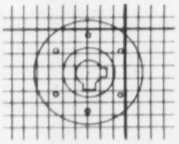
Phantom ruled vellum leaves more time for creative drafting

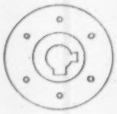
Working with scaling aids often takes valuable time from the basic job of creative drafting. Add the wasted hours spent drawing guide lines, lettering and handling similar routine drafting problems, and you have the reasons why POST developed Phantom Ruled Blutex.

This new vellum is basically POST's Blutex, unchanged except for the addition of phantom grid lines. The result is a combination of all the time-saving advantages of grid paper with all the drawing and reproduction advantages of fafamous Blutex vellum.

By using the grid lines, a draftsman works quickly to scale without constantly reaching for scaling instruments. Proportioning and resizing are easier and faster. Freehand drawing truly becomes a rapid, highly creative method of recording ideas. Even lettering and dimensioning are transformed into simpler, less time-killing jobs.

In printmaking, the grid lines disappear completely, leaving a sharp, contrasty print.





More about Blutex

The carefully controlled, uniform tooth on Blutex's surface easily "takes" dense, opaque pencil lines that resist smudging and smearing. Those sharp lines, plus Blutex's excellent transparency, assure fast printback and sharp reproductions.

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Free sample offer

For a test sample, write to the Reader Service Division of Frederick Post Company, 3658 N. Avondale Ave., Chicago 18.

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. . . Coney Island sewage

(Continued from page 233)

192 ft section has 20 in. diameter diffusers on 16 ft centers.

Wage rates in New York City range from $2.80 + 22¢ fringe benefits for common labor to $3.90 + 31¢ for carpenters and $4.25 + 34¢ for crane operators.

The four bidders included:

1C	Spearin, Preston & Burrows, Inc., N.Y., N.Y.	$2,971,053
2	J. Rich Steers, Inc., New York, N.Y.	3,188,000
4	Merritt-Chapman & Scott Corp., N.Y., N.Y.	3,943,133
EE	Dept of Pub Works, City of New York, N.Y. Greeley & Hansen, Chicago, Ill., consultants	2,595,408

Bids: 7-17-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Outfall: land portion	lf	1,660	$300.00	$387.00
parkway xing	ls	job	180,000	182,250
marine portion land to US bulkhead	lf	138	600.00	550.00
US bulkhead diffuser	lf	6,889	277.00	270.00
diffuser section	ls	job	75,000	105,100
Wood piles	lf	30,000	2.00	4.40
Effluent structure	ls	job	55,000	41,600
Sludge line	ls	job	50,000	69,900
Repl exist services	ls	job	25,000	49,300
Addl exc: land portion	cy	500	6.00	16.50
marine portion	cy	8,500	4.00	2.50

Time Schedule: 365 calendar days
Liquidated Damages: $150 per day

Sewers, Lift Stations Treatment Plant, Oregon

Difficult site conditions complicate this new sewerage installation for Clatskanie, Ore. Intercepting sewers are in a low-lying area along the river bank where water control during construction and access conditions are both difficult. Lines cross or go through a river tidal breakwater, 30% are in or across primary highway right of way with rock fill subgrade, and pile trestle support is required for several hundred feet of sewering.

N. W. Haner & Assoc., Portland, Ore., consulting engineers, let the job in these three parts:

Sanitary Sewers	$47,298
Underground Lift Stations	40,779
Sewage Treatment Plant	94,342
Total, 260,000 gpd capac.	$182,419

Distribution of costs between interceptors, pumps and treatment is:

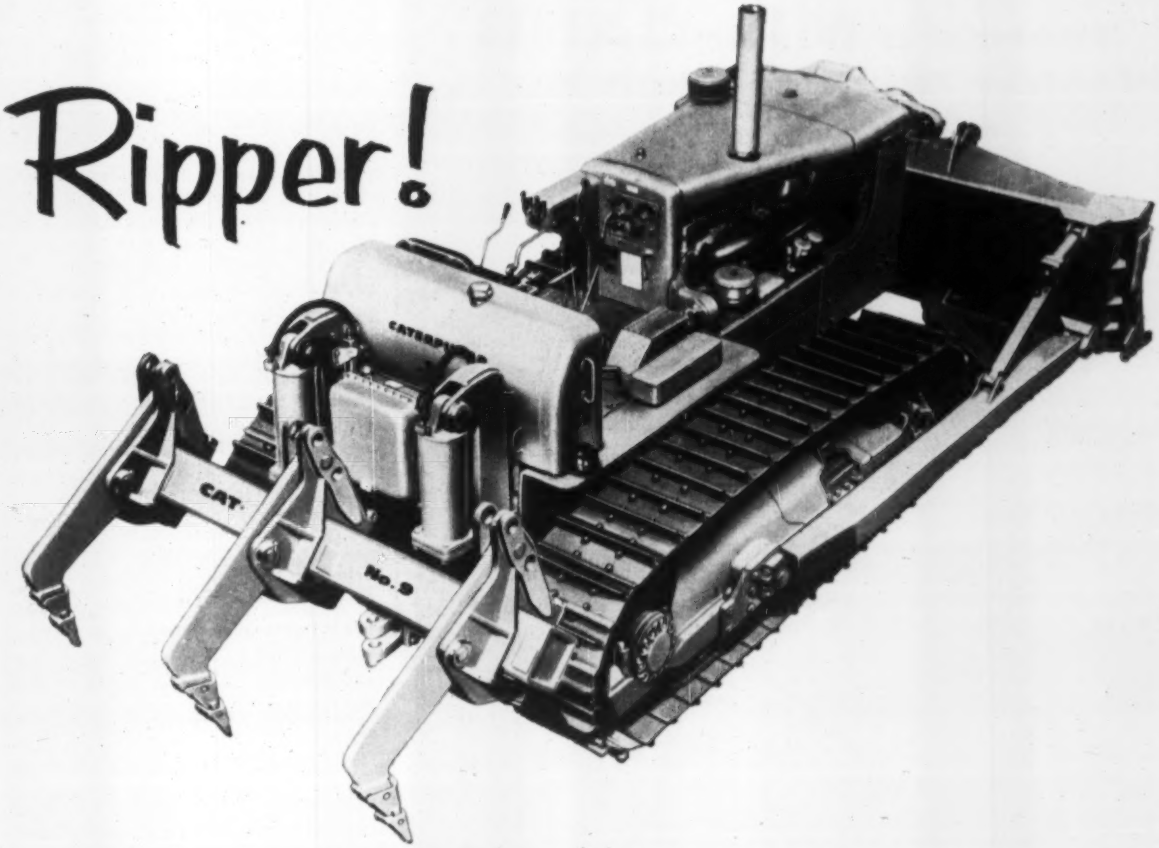
Sewers, 5,700 lf 6-15″	25.9%	27.9%
3 pumps, 100, 200, 500 gpm	22.3	26.8
Treatment, 260,000 gpd	51.8	45.3

Cast iron pipe with mechanical joints, Fed Spec WW-P-421 is specified. The contractors furnish all materials and equipment. Concrete for structures must test at 3,000 psi. Wages prevailing in the area range from $2.15 for common labor to $2.25 for semiskilled and to $3.00 for skilled workers.

The main lift station, 500 gpm, was let on an alternate bid for Flushkleen pumps with auxiliary gas engine drive on one unit.

(Continued on page 236)

Ripper!



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Near Molt, Montana, a Caterpillar D9 Tractor rips sandstone materials to be used as base course for a new state highway. Its hard-working "tentacles" obtain their power from a Denison hydraulic pump.

The No. 9 Ripper, newest tool designed for the famous D9, is one more of Caterpillar's rugged construction units to be factory-equipped with Denison hydraulic equipment. In this unit, a Denison "T" series vane-type pump, capable of delivering up to 2000 psi continuously, is driven by the engine power take-off. It actuates hydraulic cylinders which operate the Ripper accessory.

Manufacturers of all types of construction machinery are selecting Denison equipment for hydraulic systems because they know the name Denison is synonymous with efficiency, durability and dependability. Denison Engineering Division, American Brake Shoe Co., 1162 Dublin Road, Columbus 16, Ohio.

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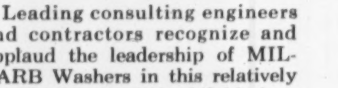


THE WORLD'S LARGEST PRODUCER OF WASHERS

. . . Oregon sewers

(*Continued from page 234*)

The treatment plant foundation is on piles.

A submerged river crossing is provided for pressure main plant influent and water utility. The cast iron pressure main crossing is on a bridge structure over the Clatskanie River.

Units in the treatment plant include: primary clarifier-digester, 26 ft diam on pile foundation; high-rate filter, 32 ft, diam with 1:1 recirculation ratio; filter and secondary sludge recirculation pumps; secondary clarifier tank and chlorine contact chamber; 12 in. AC outfall sewer to river; open sludge drying beds 26 ft by 38 ft; automatic chlorination equipment with provision for prochlorination; sewage flow meter. The laboratory and chlorinator building is 15 ft by 24 ft.

Schedule 1
5,700 lf Sanitary Sewers, 6 to 15"

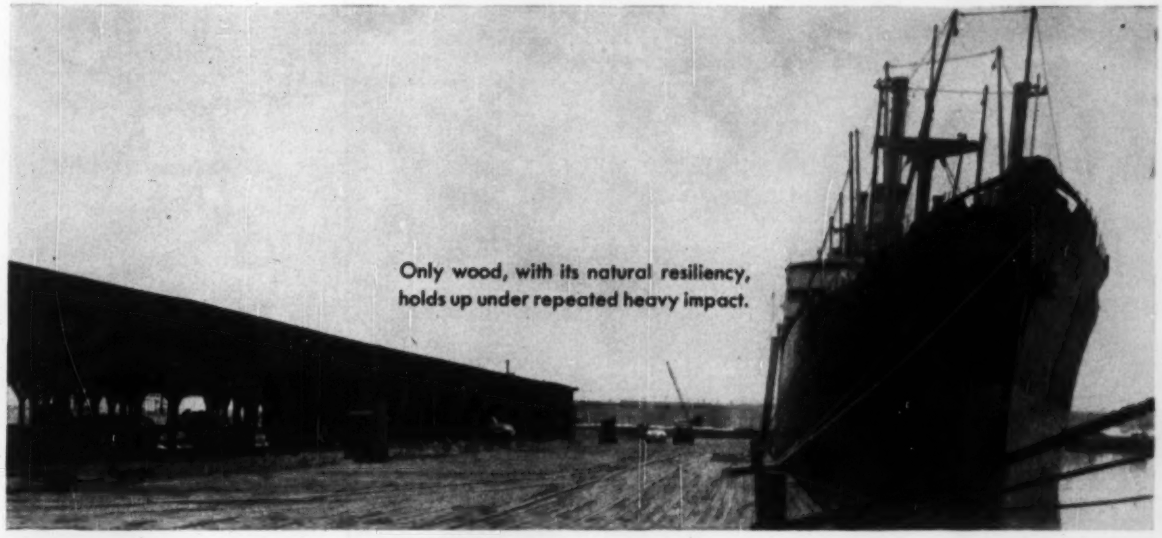
		ACP	CP Alt
1C	A. F. Houston, Underwood, Wash	$47,298	$43,173
	Contract $44,787		
2	Harold E. Olds, Tacoma, Wash	58,069	53,275
3	George W. Lind, Portland, Ore	65,748	62,126
EE	N. W. Haner & Assoc., Portland, Ore	45,975	42,324

Bids: 6-10-57 Items	Unit	Quantity	Unit Prices 1C	2
Excav, trench, 0-6'	lf	1,605	$2.00	$4.40
6-8'	lf	2,000	2.00	1.75
8-10'	lf	475	2.00	2.10
10-12'	lf	525	2.00	2.50
12-14'	lf	355	2.00	3.10
ACSP in pl, 6"	lf	350	2.50	1.97
8"	lf	1,355	3.00	2.69
10"	lf	1,610	3.40	3.31
12"	lf	765	3.85	4.06
14"	lf	660	4.33	4.76
CSPR jts in pl, alt 6"	lf	350	2.00A	1.23A
8"	lf	1,335	2.25A	1.75A
10"	lf	1,610	2.50A	2.37A
12"	lf	765	3.00A	2.95A
15"	lf	660	3.50A	3.90A
CISP, 6"	lf	107	3.00	3.85
Sewer pipe trestle	lf	80	1,000	4,500
Pressure main in pl				
Cl 4" M jt Bridge Xing	ls	(lf 120)	750.00	630.00
Hwy Xing	ls	(lf 190)	1,000	518.70
WI 6" River Xing	ls	(lf 250)	2,000	5,915
3" water	ls	(lf 255)	2,000	1,020
AC to plant site, 6"	lf	300	2.00	1.97
GI water to site, 3"	lf	415	2.00	2.94
Serv conn ftgs in pl				
Cl Wye 6x4	ea	1	7.34	21.00
6x6	ea	1	7.34	21.00
AC Wye 6x4	ea	6	7.34	14.47
6x6	ea	1	7.34	14.75
Cl 90° Tee 8x4	ea	18	9.89	18.00
8x6	ea	3	10.55	18.97
10x4	ea	15	12.02	21.00
10x6	ea	1	12.71	22.00
12x4	ea	13	14.03	23.80
12x6	ea	4	14.69	24.75
14x4	ea	3	16.05	29.40
14x6	ea	1	16.75	29.40
Alt serv conn ftgs in pl				
Cl Wye 6x4	ea	1	7.34	21.00
6x6	ea	1	7.34	21.00
Conc Wye, alt 6x4	ea	6	4.06A	10.36A
6x6	ea	1	4.06A	11.00A
8x4	ea	18	4.84A	12.40A
8x6	ea	3	4.84A	13.00A
10x4	ea	15	7.69A	16.00A
10x6	ea	1	7.60A	18.00A
12x4	ea	13	9.48A	19.50A
12x6	ea	4	9.48A	20.00A
15x4	ea	3	14.84A	24.00A
15x6	ea	1	14.84A	25.30A
Gravel bedding in pl	cy	15	5.00	10.00
Manholes in pl to 6'	ea	1	250.00	238.00
6 to 8'	ea	14	250.00	270.00
8 to 10'	ea	2	250.00	300.00
10 to 12'	ea	3	250.00	338.00
12 to 14'	ea	1	250.00	372.00
Cleanouts: in pl standard	ea	3	25.00	84.00
Brass serv plugs	ea	3	25.00	91.00
Sidewalk, conc incl curb	lf	130	5.00	6.30
Paving bit street	lf	1,085	4.00	2.80
asph conc hwy	lf	280	4.00	4.00
Repav alter hwy	lf	280	4.00	4.00
Backwater V in MH	ea	3	100.00	108.50

Completion Schedule: 180 days.
Liquidated Damages: $10 per day.

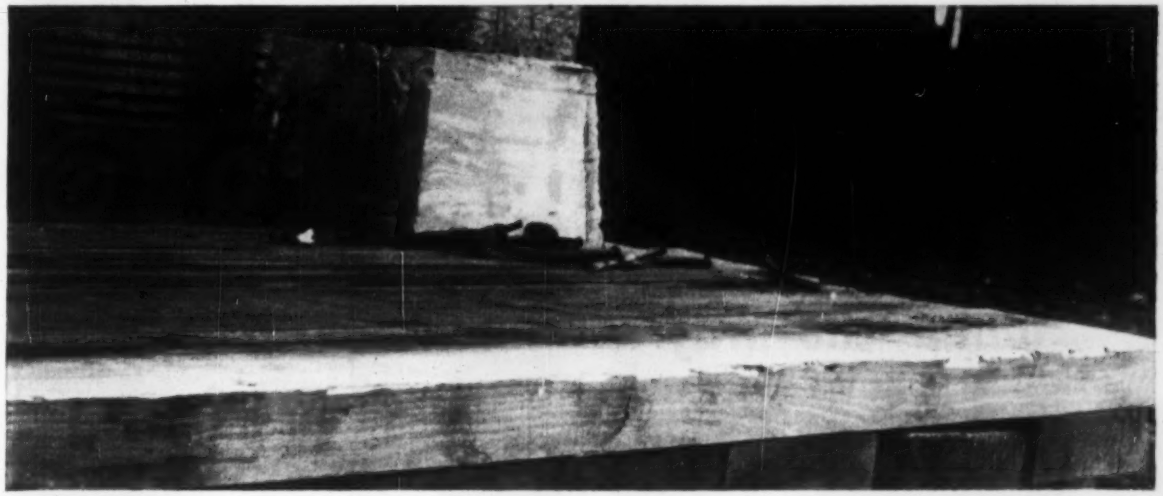
(*Continued on page 239*)

On the Kansas City Southern:



Only wood, with its natural resiliency, holds up under repeated heavy impact.

Penta protects this lumber shed



against rot and termite attack

Rot and termites strike quickly in the warm, moisture-laden atmosphere of Port Arthur, Texas. Ordinarily, they'd make fast work of the Kansas City Southern Railway lumber shed located there.

But the Penta-treated wood used in much of the shed's flooring and many of its supporting members means it will stay strong, solid and resilient for many years to come, despite any number of termites or rot organisms nearby. Penta-treated wood is selected for such installations because of its immediate availability, low initial installation cost, and reduced cost of annual upkeep.

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Lima Type 604 Dragline excavating trench for storm sewer pipe in Miami, Florida. This machine and the other Lima Type 604 in the background are owned and operated by R. H. Wright & Son of Fort Lauderdale and are both equipped with 45-ft. booms.

Fast-working team of LIMAS leads the way on Miami project

Work really moves along at top speed on this storm sewer job in Miami, Florida, where R. H. Wright & Son is using two LIMA Type 604's. The dragline excavates the trench while the crane follows closely behind laying the pipe—sewer jobs of all kinds are completed fast and economically when you have LIMAS on the job.

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Lima Type 604 lowering concrete sewer pipe into position on the same project.

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. . . Oregon sewers

(Continued from page 236)

Schedules 2 & 3

Everett L. Wiggins	2 Lift Stations	1C	$40,779
Portland, Ore	3 Treatment Plant	2C	94,342
Packard Pipe & Pump	2 Lift Stations	2	55,663
Longview, Wash	3 Treatment Plant	1	94,152

Both contractors placed contingent bids, that they get both contracts or neither

2 Lift Stations

Bids: 6-10-57 Items	Lump Sum Prices 1C	2
100gpm station		
Structure, complete for dupl ej	$6,000C	$9,975
sing ej	6,000A	9,815A
Ejector, 100 gpm, compl, duplex	3,442NC 4,685Y	3,866NJ ......
single	1,621A	2,483A
200gpm station		
Structure, complete for dupl ej	7,596C	11,885
sing ej	7,596A	11,665
Ejector, 200gpm, compl, duplex	5,741NC 6,572B	6,508NJ
single	2,671A	3,880
Main lift station, 500gpm		
Sub-struct, compl dupl ej	5,560	10,800
"Flush Kleen"	8,585AC	14,833A
sing ej	5,560A	10,670A
Sup-struct, compl dupl ej	2,915	1,400
"Flush Kleen"	3,094AC	1,400A
sing ej	2,915A	1,400A
Pump, piping 500gpm dupl ej	7,975Y 6,511N	7,521NJ
"Flush Kleen"	6,315AC	7,196A
sing ej	3,261A	4,493A

A alternate bid C contract N Nash NJ Nash-J
B Blackburn Y Yoemans

Completion Schedule: 270 calendar days
Liquidated damages: $10 per day

3 Sewage Treatment Plant

Bids: 6-10-57 Items	Lump Sum & Ratio Prices 2C		1	
Grading, site	$7,700	8.2%	$4,200	4.5%
Roadways, gravel	1,200	1.3	588	0.6
Concrete, exterior, walks, curb	400	0.4	325	0.3
Fencing	1,029	1.1	2,072	2.2
Spiragester, fdn piles	4,800	5.1	3,700	3.9
struct, conc	13,158	13.9	20,500	21.8
steel, fab pipg	11,857	12.6	13,452	14.3
pump, recirc.	748	0.8	850	0.9
Barminutor, comp	2,191	2.3	2,450	2.6
Filter high rate, struct, conc	4,697	5.0	6,700	7.1
bottom	1,570	1.7	2,200	2.3
media ip	1,800	1.9	1,440	1.5
Piping, distribution & inside	3,700	3.9	3,050	3.2
Clarifyer, Cl cont unit				
struct, conc & pump pits	3,999	4.2	5,000	5.3
steel, fab & inside piping	3,442	3.6	1,325	1.4
Sludge beds,				
struct, conc & Ap	1,327	1.4	2,140	2.3
sand & gravel	250	0.3	260	0.3
Pump & pipe, recirc, filter	700	0.7	700	0.7
sludge	1,200	1.3	600	0.6
Building, lab & chlor, compl	8,857	9.4	5,600	5.9
Chlorinator & Access, compl	2,647	2.8	3,200	3.4
Meter, sewage flow	1,000	1.1	1,200	1.3
Piping, out structures, compl	12,241	13.0	9,200	9.8
Electrical work, complete	3,829	4.1	3,400	3.6

Completion Schedule: 270 calendar days
Liquidated Damages: $25 per day

Storm Drain, Los Angeles

These storm drains in the City of Santa Monica, designed in three sections, are under contract to M. Miller Co., Los Angeles, for $274,329. Work is for Los Angeles County Flood Control District and the City of Santa Monica Department of Engineering.

The mainline is 2,760 ft of 48″ reinforced concrete pipe. The second section is 331 ft of open channel, 6′ x 31′4″ reinforced concrete. The third section is 270 ft of corrugated metal pipe, 60 in. 8 gage, asbestos bonded, asphalt coated with paved invert.

Wages set under California's labor code include: common laborers $18/day, carpenters $24, tractor operators (with attachments) and trenching machines up to 7 ft depth $24.40/day, over 7 ft depths $26.40, trucks drivers $19.24 to $22.28/day.

Bidders included:

1C	M. Miller Co., Los Angeles, Calif	$274,329
2	Robert C. Watson, Glendale, Calif	276,666
5	N. M. Saliba, Gardena, Calif	338,699
EE	Dept of Engineering, Santa Monica, Calif	268,741

Bids: 7-26-57 Items	Unit	Quantity	Unit Prices 1C	2
Structure, spec junction	ls	job	$2,000	$3,000
RCP 3100D, 48″	lf	8	100.00	120.00
1800D, 48″ to be jckd.	ls	job	2,000	1,200
1800D, 48″	lf	1,018	43.00	40.00
1600D, 48″	lf	461	41.00	40.00
1400D, 48″	lf	771	41.00	40.00
1200D, 48″	lf	473	40.00	35.00
1100D, 30″	lf	51	34.00	35.00
2000D, 21″	lf	40	31.00	33.00
2200D, 18″	lf	78	30.00	30.00
2000D, 18″	lf	230	24.00	30.00
1750D, 18″	lf	251	24.00	30.00
1500D, 18″	lf	205	24.00	30.00
MH no 2	ea	7	700.00	650.00
no 4	ea	1	850.00	800.00
CB no 1	ea	11	325.00	350.00
no 2	ea	4	500.00	450.00
no 3, W=10′	ea	1	600.00	600.00
no 3, W=14′	ea	3	700.00	700.00
no 3, W=28′	ea	2	1,350	1,400
no 7, 1 grate	ea	6	500.00	600.00
no 7, 2 grate	ea	1	775.00	800.00
no 7, 3 grate	ea	1	1,050	1,000
JS no 2	ea	1	300.00	300.00
Concrete, LD	sf	1,622	1.30	1.00
Pipe supports	ea	9	75.00	90.00
Excav, open chan & bridge	ls	job	7,500	5,000
Piles, timber f&d	lf	4,275	5.00	7.00
steel sheet f&d	ls	job	14,000	15,000
Steel, reinf	lb	80,694	0.15	0.14
Cement, type V	bbl	960	5.25	5.50
Conc, reinf, chan & bridge	cy	640	47.50	45.00
Fence, 5′ chain link	lf	664	3.00	3.00
CMP, 60″	ls	job	17,500	17,000

Completion Schedule: 8-20-57 to 1-17-58, 150 calendar days
Liquidated Damages: $50 per day

Retarding Structures for Soil Conservation, Missouri

This $32,322 contract to Trager Construction Co., Olathe, Kans. is for four watershed protection structures at Elm in Johnson County, Mo., in the Blackwater Watershed, for the Soil Conservation Service, Columbia, Mo.

Bidders included:

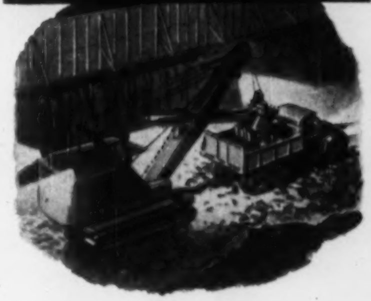
1C	Trager Construction Co., Olathe, Kansas	$32,963
2	Highway Structures Inc., Independence, Mo.	43,099
EE	Soil Conservation Service, Columbia, Mo	34,342

Bids: 7-10-57 Items	Unit	Quantity	Unit Prices 1C	2
Clear & grub		$4,335.30	90%	75%
Excavation, struct	cy	1,469	$1.60	$0.90
core	cy	1,946	0.40	0.26
Earth fill, cl I	cy	24,711	0.31	0.24
cl II	cy	32,212	0.30	0.23
compact, water	Mg	68.0	10.00	2.00
Diversion	lf	950	1.40	0.09
Grading watercourse	lf	593	1.80	0.10
Waterway improvement	lf	365	2.10	0.30
Conc, reinforced	cy	62.26	57.85	37.50
plain	cy	50.53	54.75	35.00
Steel, reinf, f&p	lb	4,449.6	0.25	0.15
Spillway RCCP, SS, 18″	lf	108.0	7.00	7.00
30″	lf	90.0	12.00	11.00
ES, 30″	lf	234.0	14.00	12.00
Drng-helical CMP 6″ 16 ga				
Act	lf	215.0	1.80	2.25
perforated	lf	452.0	2.00	7.00
Bank drains	cy	48	15.00	12.00
Trash racks & guard rails	ls	job	150.00	450.00
Steel pipe, galv, 1½″	lf	212	0.60	0.60
Valve	ea	2	10.00	15.00

Completion schedule: 160 calendar days Act asphalt coated

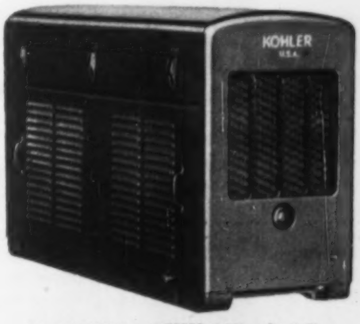
(Unit Prices cont'd. on p. 243)

KOHLER
ELECTRIC PLANTS



Round-the-clock reliability for on-the-job power needs

The high reputation of Kohler electric plants has been built by smooth-running efficiency and low-cost operation on major construction jobs the world over. Sizes from 500 watts to 50 KW for every on-the-job power requirement, include lightweight portable models for floodlights, saws, drills, other power tools. Write for folder 15-E.



Model 2MH21, *2KW. 115 volt AC, with housing. Liquid-cooled*

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ELECTRIC PLANTS • AIR-COOLED ENGINES
PRECISION CONTROLS

Steeltex eliminates costly pre-construction engineering required by other centering materials. It gives clean, dependable reinforcing form in any lengths needed regardless of variation in joist spacing. Steeltex is light, easy to handle.

Steeltex speeds college construction

Contractors tell of money-saving advantages gained from Pittsburgh Steel's floor lath on Purdue and University of Kentucky jobs

The critical need for new school buildings to handle our expanding population is also acute on college campuses.

At Purdue University and University of Kentucky, where married veterans and their families are crowding housing facilities, big construction programs are underway. At both universities, Steeltex wire mesh reinforcing floor lath was specified by architects because it helps achieve the most value for each construction dollar.

Purdue is engaged in a $9½ million project to house married students in a unique 58-building development located on a 30-acre site at the edge of the West Lafayette, Indiana, campus.

In Lexington the University of Kentucky is building the $2 million Shawneetown married students and faculty housing project on a 10-acre site adjacent to the campus to provide 186 apartments for married students and faculty members.

In Indiana, since economy of construction was an important factor to university authorities, Architect John R. Diehl of Fairless Hills, Pennsylvania, specified Pittsburgh Steel Products' Steeltex, the reinforcing that carries its waterproofed form right on its back.

The 370,000 square feet of Steeltex, used to cover joists on the first and second floors of the units, will return substantial savings in time and money while assuring durable concrete floors.

John W. Galbreath & Co., Columbus, Ohio, teamed with Turner Construction Co. of New York City to form Galbreath-Turner, general contractors for the construction.

Earl Wooten, superintendent for Carl Vestal, Inc., Indianapolis, sub-contractor who installed the Steeltex, gave this estimate of the time saved by using Steeltex to cover 370,000 square feet of floors.

"If we had used another material, each of these 58 buildings would take six days and require 20 men's services. With Steeltex, however, we needed only one and one-half days and the services of five men for each building."

Similar commendation came from the Kentucky project where Ben Landin, general superintendent for the Hargett Construction Co., of Lexington, said:

"I like Steeltex because of the installation speed. If we had to use a reinforcing material that required wooden forms, it would call for a heavier slab—about four inches thick. But with Steeltex, we need only a 2¾-inch slab which gives us lighter-weight construction.

"Another advantage is that Steeltex provides lateral stability for the joists. A stronger structure is the result.

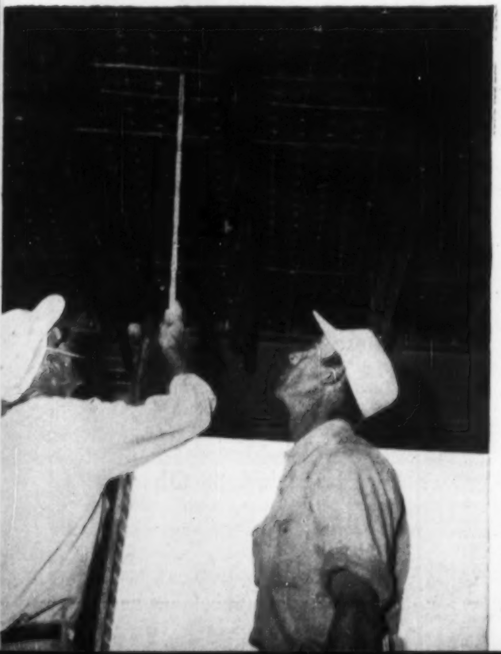
"I believe that Steeltex is far superior to any other type of material for fitting around irregular-shaped objects quickly and snugly. We don't waste as much concrete and we complete the job faster."

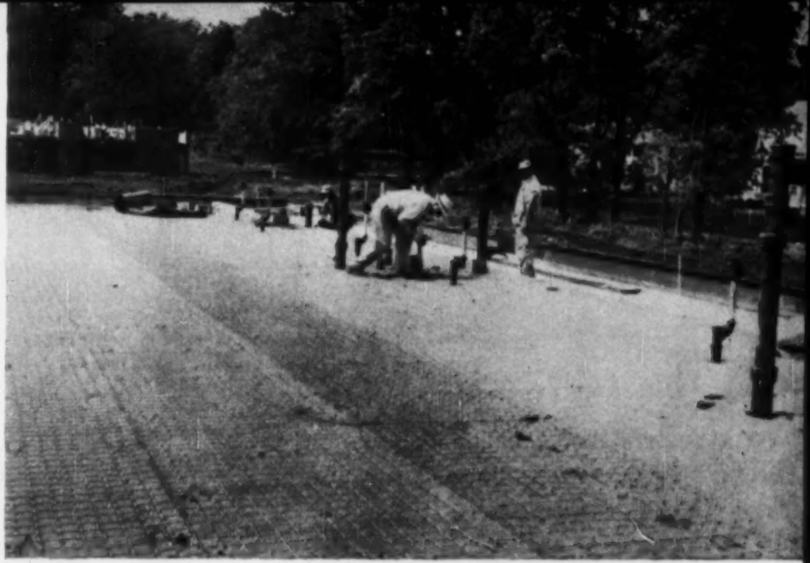
And Lewis H. Hargett, president of the contracting firm, cited these Steeltex advantages: "It's economical, it's convenient to install and the men on the job don't need any special training to install it."

He added, "In recent years, we've used several hundred thousand square feet of Steeltex and found it completely satisfactory. After checking the cost of Steeltex over other materials, we find there is a definite saving per square foot in using Steeltex."

These same advantages can work for you when you use Steeltex, sold by the Pittsburgh Steel Products Division of Pittsburgh Steel Co. Start pocketing these savings now. You can do that by picking up your telephone now and getting in touch with one of the trained engineers waiting to help you in each of the district offices listed below. Do it today.

Superintendent Ben Landin (left) of Hargett Construction Co. points to clean, neat appearance of Steeltex under concrete slab to Superintendent Jim League, Whalen Erecting Co. which installed Steeltex.





Pittsburgh Steeltex is installed faster than alternate materials. Here it's being installed at the University of Kentucky's housing project.

Steeltex fits around irregular piping, vents and projections. Easy to cut, it speeds construction and saves money.

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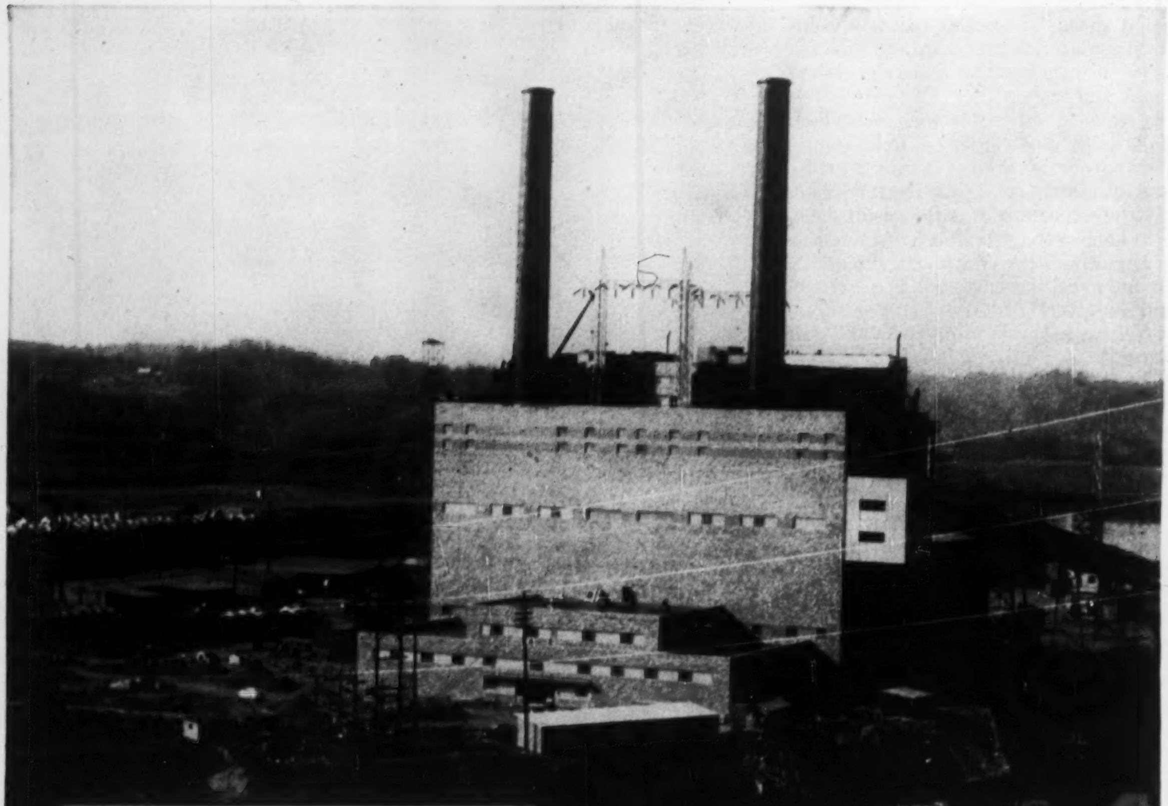

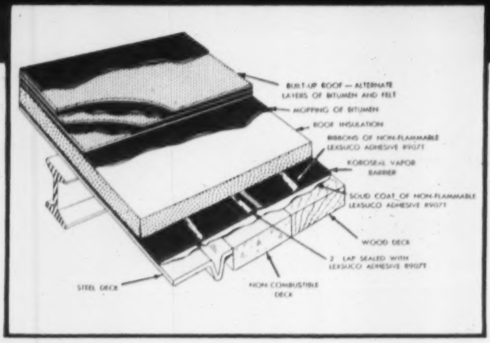
BUILT-UP ROOF — ALTERNATE LAYERS OF BITUMEN AND FELT
MOPPING OF BITUMEN
ROOF INSULATION
RIBBONS OF NON-FLAMMABLE LEXSUCO ADHESIVE R907T
KOROSEAL VAPOR BARRIER
SOLID COAT OF NON-FLAMMABLE LEXSUCO ADHESIVE R907T
WOOD DECK
2" LAP SEALED WITH LEXSUCO ADHESIVE R907T
NON-COMBUSTIBLE DECK
STEEL DECK

Lexsuco roofing with Koroseal gives added protection against fire at Power Plant

Protection against fire was a key point of consideration when roofing materials were specified for Ohio Power's new Muskingum River Plant in Southeastern Ohio. That's one reason why a fire-retardant Lexsuco Roof Construction with Koroseal Vapor Barrier was selected.

Lexsuco Roofing with Koroseal Vapor Barrier reduces fire danger by eliminating flammable asphaltic materials from between the roof deck and roof insulation. These flammable materials are replaced with flame-resistant Koroseal Vapor Barrier secured with either Non-flammable Lexsuco Adhesive R 907 T or the Lexsuco Insulation Clip.

Because Lexsuco Roof Constructions have been tested and Classified Class I by Factory Mutual and approved by Factory Insurance Association, they can often influence insurance rates and reduce sprinkler requirements, depending on building contents. Engineered application methods make installation simple, fast and economical.

To protect building investment against fire disaster and damage caused by moisture migration, always specify Lexsuco Roof Constructions with Koroseal Vapor Barrier. There is no "or equal."

LEXSUCO
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• *Write for AIA Information File*

4815 Lexington Avenue • Cleveland 3, Ohio

Runway at Charleston Air Base Is a Complex Job

Like so many big jobs these days this $1,761,622 contract to Robert E. Lee & Co., Inc., Manning, S. C., for extending the primary runway at Charleston Air Force Base in South Carolina, requires tearing out existing structures as well as putting in new. It includes major drainage, moving a railroad, installing new lighting. Work is under the direction of the Charleston District, Corps of Engineers.

The time allotted is 360 calendar days including final cleanup, with these priorities:

1. **Both primary and secondary runways active.** Complete outfall ditch before grading for runway extension, also railroad, soil road, perimeter road without interruption of road or railroad service.

2. **Primary runway active, secondary closed.** Install duct for all electrical conduits across secondary runway at points 100 ft from edge of existing primary runway pavement on each side.

3. **6,500 ft of primary runway active, secondary runway active.** Complete all clearing, drainage and grading on extension, overrun area, warm-up pad, roads, railroad and part of new taxiway prior to widening existing primary runway, also work on first 500 ft of extension and taxiway junction with existing taxiway.

4. **Primary runway entirely closed, secondary active.** Complete widening including grading, sub-base, base and pavement except 500 ft on each side of intersection, also pavement on balance of runway extension, warm-up pads, etc. Remove and reconstruct runway barrier and seal cracks in existing pavement.

5. **Primary runway active for 5,400 ft NW of intersection of secondary runway, secondary runway active 5,300 ft SW of intersection.** Contractor to work 24 hr/da, 7 da/wk including holidays to complete 1,000 ft of widening primary runway.

The government supplies some materials for the contractor to install including airfield lighting fixtures, supplies and equipment. The contractor is required to salvage some of the material and equipment removed. Concrete mixtures are designed to produce 650 psi flexural strength in 28 days. Cement may be portland, portland blast-furnace slag or a blend of portland-slag or portland-natural.

Quantities to be handled include 453,500 cu yd of unclassified excavation, machine grading of 5,630 lin ft of soil access road, 65,799 sq yds of 15″ to 17″ and 108 sq yd of 8″ concrete pavement, 84,568 sq yds of airfield flexible bituminous pavement with base course, 48,349 sq yds of 1½″ asphaltic concrete roads with base, 12,511 sq yds of soil road, 2,340 sq yd of stabilized aggregate surface, 400,000 lin ft of cracks to be sealed, 10,250 lin ft of railroad trackage including 4 #8 turnouts and 6 road-RR crossings, salvage of 3,000 lin ft of existing rail, furnish and install 10,112 lin ft of storm drainage, 2,066 lin ft of water line, 4 creosoted timber bridges, install 9,000 lin ft of runway high intensity lighting, 1,500 lin ft of approach lighting system, furnish and erect 12,110 lin ft of barbed wire fence, 100 lin ft of 7 ft chain link fence and gates, seed and sprig 160 acres of land.

Minimum wages set for this job include: carpenters $2.45, cement finishers $2.00, electricians $3.00, asphalt distributor operator $1.85, asphalt finish machine operator $2.00, concrete finishing machine operator $2.00, concrete paver operator $2.55, tractor operator $2.00, laborers $1.05.

The 10 bidders for this complex job included:

1C	Robert E. Lee & Co., Inc., Manning, S. C.	$1,761,622
2	Suber and Co., Inc., Whitmire, S. C.	1,774,463
10	Lycoming Construction Co., Inc., Williamsport, Pa.	1,955,423
EE	Charleston District, Corps of Engineers	1,731,525

Bids: 3-1-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Clear & grub	ls	job	$30,000	$20,500
Clearing, selective	ls	job	20,000	22,500
Excavation, unclass	cy	453,500	0.65	0.56
Surf crse, stabil agg, for CAA facility, 3″	sy	704	0.54	0.97
6″	sy	1,636	0.81	1.24
Base crse, stabil agg, for roads, 6″	sy	48,349	1.05	1.21
cr agg. graded, for airf flex pave, 6″	sy	39,029	1.26	1.57
8″	sy	22,333	1.58	1.99
for runway blast pad, 10″	sy	4,211	1.93	2.10
for stabil overrun, 12″	sy	18,995	2.28	2.55
Select matl, sand clay, subbase & surf crse for airf, flex pvmt & access soil road, 6″, comp meas.	sy	48,055	0.93	0.95
10″, compacted meas.	sy	22,333	1.38	1.71
Asph conc, bind & level crse	t	5,900	5.50	6.00
surf crse	t	9,100	5.25	5.77
Double bit surf treat, excl bit matl	t	700	7.00	7.55
Bit matl for prime ct, tack ct, in mix for bind, surf & level crse & dbl bit surf treatment	gal	295,100	0.115	0.1325
Seal cracks in exist asph conc overlay of conc pave for primary runway sys	lf	400,000	0.025	0.025
Pave, PCC, for GCA facilit 9″ uniform	sy	108	6.90	6.00
Pave, PCC, 15″, minimum	sy	25,621	7.11	7.27
17″, uniform	sy	10,991	7.77	8.44
15″-17″-17″-15″	sy	29,187	7.40	7.63
Proof roll, addnl, 3 coverag 1 unit—2,500 sf	Unit	10	50.00	50.00
RR track, complete	lf	10,242	10.00	8.95
Turnout, No. 8, complete	ea	4	2,800	2,500
RR crossing, complete	ea	6	600.00	1,050
Signs, RR crossing	ea	8	45.00	35.00
advance warning	ea	6	25.00	20.00
Salvage exist rail for Gvt	lf	3,000	0.15	0.40
Machine grade access road	Mlf	5.63	200.00	125.00
Fence, 3-str brb wire, 4′	lf	12,110	0.25	0.45
chain link & brb wire, 6′	lf	100	2.25	2.65
Gate, dbl swing, brb wire 4′	ea	1	50.00	55.00
2 13′ pan chain link 6′	ea	1	280.00	283.00
Rem, salv & relocate fence, barbed wire 8STV3 incl.	lf	240	0.85	0.88
chain lk & brb wire	lf	41	0.80	0.90
gate, chain link 15′ wide	ea	1	30.00	32.00
Remove and dispose of fences, misc	lf	1,590	0.35	0.35
frame residence w/outer bldgs	ea	4	100.00	111.00
pave, conc, 9″-6″-6″-9″	sy	4,600	0.30	0.50
Marking, runways, taxiways, blast pads, overrun & road	ls	job	8,750	8,028
Sprigging, incl fertilizer	ac	160	122.00	120.00
Seed (overseeding)	ac	160	11.00	16.00
Refertilizing	ac	30	35.00	39.00

Bids: 3-1-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Storm drains, f&d				
RCP, 54″, SS, or CMP, 54″ 12-ga, lined, CMP, 66″, 10-ga, std jt	lf	1,160	30.00	27.00
RCP, 54″, SS, CMP, 12-ga, lined or 12-ga, type I, std jt	lf	256	30.00	27.50
CMP, 54″, 8-ga, lined, or type I, std jt	lf	128	86.50	90.00
RCP, 48″, SS, CMP, 48″, 12-ga, lined, or 54″, 12-ga, type I, std jt	lf	1,790	25.00	29.00
RCP, 42″, SS, CMP, 42″, 12-ga, lined, or CMP, 54″ 12-ga, type I, std jt	lf	872	24.00	22.00
water-tight joint	lf	408	24.00	27.50
RCP, 42″, SS, CMP, 42″ or 48″, std jt	lf	980	20.00	20.50
RCP, 42″, ES, CMP, 42″ or 48″, std jt	lf	36	23.00	21.50
SS, water-tight jt	lf	80	24.00	28.00
ES, water-tight jt	lf	204	27.00	28.00
RCP, 36″, SS, CMP, 36″, lin, or CMP, 42″, std jt	lf	800	18.00	15.25
CMP, 36″ lined or type I, std jt	lf	36	16.00	15.25
RCP, 30″, SS, CMP, 30″, 14-ga, lined, or 36″, 12-ga, std jt	lf	950	10.00	13.00
RCP, SS, CMP 14-ga lined or type I, 30″, std jt	lf	530	10.00	13.00
24″, std jt	lf	184	7.50	9.00
RCP, SS, 18″, or CMP, 16-ga, 21″, water tight jt	lf	80	9.00	7.00
std jt	lf	780	7.00	5.50
RCP, SS, or CMP, 16-ga, 18″, std jt	lf	60	7.00	6.00
15″, std jt	lf	408	6.40	4.50
12″, std jt	lf	370	4.50	4.40
Plug, conc, for RCP, 24″	ea	2	25.00	25.00
Remove & Salvage CIP, 42″	lf	52	20.00	20.00
RCP, 36″	lf	462	3.00	5.00
24″	lf	278	2.00	4.25
18″	lf	248	2.00	4.00
arch, CMP, 18x11″	lf	70	1.00	4.00
Remove & dispose of headwall, RC, double, 36″	ea	3	100.00	150.00
single, 36″	ea	3	75.00	75.00
12″	ea	1	40.00	30.00
Drop inlet, D-1 construct	ls	job	1,000	1,160
D-2	ls	job	500.00	525.00
D-3	ls	job	450.00	660.00
D-4	ls	job	840.00	1,250
D-5	ls	job	910.00	1,600
D-5A	ls	job	910.00	1,100
D-6	ls	job	640.00	750.00
D-7	ls	job	1,210	1,750
D-8	ls	job	4,160	5,550
D-8A	ls	job	450.00	775.00
Manhole, MH-1	ls	job	790.00	380.00
MH-2	ls	job	1,300	1,675
MH-3	ls	job	1,500	1,675
MH-4	ls	job	1,200	200.00
MH-5	ls	job	1,830	1,350
Headwall, RC, straight, for dbl RCP, 54″, & CMP, 54″ or 66″	ea	1	1,260	1,400
for dbl RCP and CMP 54″	ea	8	1,260	1,200
Headwall, RC, wing-type, 45°, of end sect, galv met, for pipe, 36″	ea	2	240.00	280.00
30″	ea	2	225.00	450.00
24″	ea	10	175.00	220.00
18″	ea	4	130.00	180.00
Headwalls, RC straight or galv met end sect for 15″ pipe	ea	12	80.00	85.00
wing type, 24″ 90° for ditch drop	ea	2	150.00	200.00
Constr creo timber trestle 10′x40′ compl, inclg exc, ftgs, bents, stringers, deck curbs, backfill	ea	4	3,000	2,950
Grouted riprap, ditch drops	cy	125	15.00	25.00
Cut & repl exist asph rd pave	sy	85	1.00	5.00
Water lines & sewers				
Furn & instl new CIP, 10″	lf	1,202	5.00	4.50
MJ, 10″	lf	216	5.00	4.80
8″	lf	216	4.00	4.00
SP, 20″ sleeve	lf	216	15.00	17.00
18″ sleeve	lf	216	15.00	16.00
Rem & salv exist ACP 10″	lf	1,240	1.50	2.00
8″	lf	216	1.50	1.25
WIP 2″	lf	50	1.00	1.00
Lower exist ACP & appurt, 10″	lf	735	2.00	2.00
8″	lf	590	2.00	1.80
Reloc exist WIP, 2″	lf	150	1.50	2.00
gate valve & box, 2″	ea	1	15.00	30.00
Const new RCMH, 5′	ea	4	600.00	535.00
Encase in conc w line, 10″	lf	25	4.00	8.00
8″	lf	15	4.00	8.00
6″	lf	30	3.50	8.00
san sewer P, 8″	lf	30	10.00	15.00
Instal pipe sleeves on fuel lines, under new RR	ea	4	200.00	192.00

(Continued on page 244)

. . . Charleston Air Base

(*Continued from page 243*)

Bids: 3-1-57 Items	Unit	Quantity	Unit Prices 1 C	2
Reloc exist pipe sleeve under new RR	ea	1	200.00	125.00
Rem, salv & reloc pwr lines	ea	1	1,150	610.00
Rem & reloc fueling point	ea	1	200.00	200.00
Reloc exist 8″ stl fuel line	ea	200	5.00	2.10
Rem & reloc 8″ steel fuel line at taxiway intersect	lf	735	5.00	2.30
F&i addl new 8″ SP at taxiway intersect	lf	10	10.00	5.00
F&i new contr cable at T/W intersect	lf	1,000	0.80	0.66

Airfield Lighting

Items	Unit	Quantity	Unit Prices 1 C	2
Cut & repl with similar & equal conc pave 9″-6″-6″-9″, overlaid with 4″ asph conc	sy	192	7.50	10.00
flex pave 5″ sand asph base with 2″ asph surf	sy	75	5.00	5.00
blast pad, 4″ stab aggr base crse with 2″ asph conc surf	sy	17	4.00	3.00
Rem & disp of MH	ea	2	100.00	210.00
MH	ea	3	100.00	100.00
Const duct line conduits incl trench & backfill 6-4″	lf	280	8.00	7.29
4-4″	lf	2,055	8.00	4.56
tp II not conc encas 2-4″	lf	400	2.50	1.62
1-4″	lf	1,150	2.00	0.78
Constr incl exc & BF handhole	ea	21	300.00	475.00
manhole type A	ea	3	1,000	1,073
type B	ea	2	1,700	2,059
light base type I	ea	298	10.00	14.50
type II	ea	30	100.00	101.00
type III	ea	21	150.00	94.00
Instal approach light incl fixture transf & connectns tp MB-1	ea	44	8.00	5.00
tp MB-2	ea	50	8.00	5.00
runway light, tp C-1	ea	111	8.00	5.00
taxiway light, tp M-1	ea	72	8.00	6.00
threshold light, tp MC-1	ea	30	8.00	3.00
Rem & salv incl transformer taxiway light, tp M-1	ea	17	5.00	4.00
runway light, CAA tp	ea	80	4.00	4.00
neon approach lights, tp CAA, incl packing & crating	ea	15	15.00	10.00
Trench, incl counterpoise, BF seeding & sprigging, 1 conductr installed	lf	14,250	0.45	0.30
2 conductrs installed	lf	2,250	0.50	0.35
3 conductrs installed	lf	3,450	0.50	0.37
5 conductrs installed	lf	2,350	0.65	0.40
7 conductrs installed	lf	1,000	0.70	0.42
8 conductrs installed	lf	650	0.80	0.46
9 conductrs installed	lf	2,600	0.85	0.48
11 conductrs installed	lf	240	1.00	0.55
Instal induct line single conductr	lf	11,100	0.07	0.07
counterpoise conductr	lf	2,100	0.12	0.12
Instal ground rods on counterpoise sys, incl all connect	ea	8	10.00	11.00
regulators in vault, incl revis of exist control wiring & furnd equip & matls & taxiway switches & connect in control tower	ls	job	1,000	1,408
Reloc exist 4160 volt, 3φ, 4 wire primary in new duct & HH, incl new conductors & nec splicing	ls	job	600.00	768.00

Ground Controlled Approach Facility

Bids: 3-1-57 Items	Unit	Quantity	Unit Prices 1 C	2
Constr undergr vault, incl transf, oil fuse, cutouts, sump pump, conduit & wiring, teleph term box, safety switches & perm markers, but not incl duct line & primary conductors beyond 5′ from vault	ls	job	8,000	8,582
Constr tp A MH incl exc & BF	ea	1	1,000	1,073
duct line, 1-4″ cond tp II, not conc enc	lf	1,260	2.00	0.78
Instal primary undergr pwr line, incl splice boxes & splicing, 3-15000 volt & 1#6 bare in conduit to point 5′ from vault & 5′ from control sta	lf	1,485	4.00	4.35
Constr at control sta of new bus, incl fuse cutouts conductors, insulators & conduit to point 5′ from fence	ls	job	600.00	949.00
Runway barrier & additive item dismantl, reloc & erect f&i incl exc BF, not incl control & pwr circuits beyond 5′ from barrier site	ls	job	9,000	4,000
New control circ, 3C/#12 direct burial & in cond incl trench & BF	lf	3,050	1.50	0.61
New undergr secondary line 2-#4 in cond & direct burial incl cond, weatherhead, tr & BF	lf	1,400	1.65	0.91
Pole, cl 5,40′	ea	9	70.00	49.00
Crossarm, angle, 6 pin incl braces & hardware	ea	1	10.00	7.50
Anchors, incl rod, guy strand clamps & hardware	ea	5	25.00	23.50
Ground, driven, incl electrode conductr, clamps hardware & moulding	ea	1	10.00	16.00
Insulator, suspension type 2 disc compl with eye bolt or eyenut, conductr clamp & hardware	ea	6	6.00	11.50
Insulator, prim pin type, brown	ea	9	4.00	1.05
Secondary rack, 2 wire incl spools & hardware	ea	1	6.00	5.60
Pin, pole top, steel	ea	7	3.00	2.60
crossarm, steel	ea	1	2.00	1.20
transformer, steel	ea	1	2.00	1.00
Bracket, neutral	ea	1	2.50	2.50
Reloc transformer, 3KVA, 7200 120 volt, incl cutout, lightning arresters, jumpers, risers & connectors	ea	1	34.00	34.00
Conductor, #6 ACSR*	lf	3,500	0.10	0.07

*Conductor shall be measured horizontally along the ground. Price shall include tie wire, armour rods and connectors.

Completion Time: 360 calendar days
Liquidated Damages: $100 per calendar day

B-52 Runway, T/W and Aprons, Sheppard AF Base

Special conditions that confronted the 11 bidders on this $12,308,730 job include: storm drainage to accommodate local runoff and in addition an existing creek that traverses the work area; grading and borrow quantities in excess of 5 million cu yd and hot mix asphalt paving 2 in. thick on 50 ft of each shoulder of taxiway. Forrest and Cotton, Dallas were consultants for Tulsa District, Corps of Engineers, Lester Hagerbaumer, resident engineer. Contract went to Nolan Bros. Inc., Ft. Worth, Tex. on a low bid only 1% below the next bidder's but 13½% under the engineers' estimate.

This job at Sheppard Air Force Base, Wichita Falls, Tex., involves 13,000 lin ft of runway and requires some 990,000 sq yd of portland cement concrete ranging from 19 in. to 22 in. thick, including taxiways, aprons, overrun and blast pad. Some 190,000 sq yd of asphaltic concrete goes into shoulder stabilization. Grading, drainage, airfield marking and ducts for airfield lighting complete the job: Drainage structures include two lines of three 82 in. reinforced concrete pipe 5,930 ft long and two 72 in. 6,503 ft long. Alternates for corrugated metal pipe are permitted.

All materials are furnished by the contractor. Concrete mixes must produce an average flexural strength of 700 lb per sq in. in 28 days.

Bidders include:

1C	Nolan Bros., Inc., Fort Worth, Texas	$12,307,730
2	T. L. James & Co., Inc., & W. R. Aldrich & Co., Ruston & Baton Rouge, La	12,495,155
11	Cage Bros., San Antonio, Tex	13,789,735
EE	Tulsa District, Corps of Engineers, Tulsa, Okla, Forrest & Cotton, Dallas, consultants	14,713,040

Bids: 3-29-57 Items	Unit	Quantity	Unit Prices 1-C	2
Site preparation	ls	job	$112,000	$235,000
Excavation, grading	cy	4,900,000	0.30	0.299
borrow	cy	620,000	0.30	0.303
Select matl subbase crse 1	cy	250,000	0.25	0.50
2	cy	15,000	0.25	0.50
Storm Drains, syst 1	ls	job	655,676	495,000
2	ls	job	714,257	715,000
3	ls	job	57,234	61,000
4	ls	job	198,183	193,000
Rem & repl unstable matl, storm drn trenches	cy	15,000	0.65	1.50
Headwall lines A & C	ls	job	20,000	11,000
Struct, 4-ft watergap	ls	job	650.00	1,000
Stab agg base crse	cy	63,000	5.52	4.00
Filter course	cy	159,000	3.28	3.40
Bit prime coat	gal	105,000	0.19	0.17
tack coat	gal	17,000	0.19	0.17
Asph conc surf & bndr crse	t	32,000	6.11	6.00
Bit matl, asph conc S&B crs	gal	480,000	0.12	0.13
doub bit surf treat	gal	37,000	0.25	0.18
agg	t	1,900	11.10	6.85
P cmt conc pave	cy	530,000	7.43	8.15
Portland cement, alt	bbl	795,000	no bid	no bid
Portland cement, alt	bbl	596,250	4.25	4.00
Natural cement, alt	bbl	198,750	3.88	4.00
Repl conc pave, test holes	ea	20	10.00	100.00
Tie-down anchors	ea	2,456	4.20	5.00
Fencing	ls	job	13,276	14,000
Undergr elem fueling syst	ls	job	89,026	75,000
Water lines	ls	job	27,004	40,000
Elect duct syst, undergr	ls	job	239,598	230,000
Airfield markings	ls	job	19,278	16,000

Completion Schedule: 660 calendar days from 5-23-57
Liquidated Damages: none

Runway Extension at Sioux City AF Base, Iowa

This contract for $834,444 to Jensen & Krage, Sioux City, Ia. is for a portland cement concrete extension at the NW end of the NW-SE runway. It is 1,485 ft by 150 ft with 1,000 ft paved overrun areas at each end. Arresting barrier and associated work are included. U. S. Engineers, Omaha District has charge of the work and will supply materials and equipment for lighting extensions and barrier.

The contractor supplies other materials. Concrete will be designed to produce flexural strength of 575 psi in 14 days.

Minimum wages on the job include: common labor $1.50, concrete finishers $2.15, operators on tractors under 50 hp $1.65, over 50 hp $2.25.

The four bidders included:

1C	Jensen & Krage, Sioux City, Iowa	$834,444
2	Hallett Construction Co., Crosby, Minn	865,781
4	Peter Kiewit Sons' Co., Omaha, Neb	885,721
EE	Corps of Engineers, Omaha District	824,300

Bids: 3-8-57 Items	Unit	Quantity	Unit Prices 1 C	2
Clear & grub	ls	job	$3,500	$5,000
Excavation	cy	278,000	0.42	0.43
Subdrains	lf	9,255	3.30	2.80
flush & observ risers	ea	17	50.00	50.00
manholes	ea	10	350.00	375.00
Outlet vertical drains	ea	3	450.00	400.00
Granular filter crse	sy	54,812	0.70	0.70
Pavement, conc	cy	13,800	14.00	14.36
cement	bbl	20,700	5.05	5.15
flex, subbase crse 18″	sy	2,567	3.10	3.20
20″	sy	29,160	3.40	3.55
flex base crse	sy	31,727	1.80	1.50
Bit prime coat	gal	8,760	0.25	0.25
Surface course	t	655	17.00	35.00
Bit matls	gal	8,800	0.20	0.25
Pave, flex stab agg base crse	sy	3,338	1.80	1.50
Asphalt, R C	gal	18,400	0.22	0.25
Cover aggregate	t	850	7.00	4.65
Road excavation	cy	17,800	0.42	0.43
Perim road surf	t	6,750	2.95	2.75
RCP culv, 15″	lf	40	4.00	5.45
24″	lf	60	7.50	8.00
30″	lf	152	12.00	10.30
ex s 30″	lf	450	13.00	10.75
54″	lf	164	24.00	27.00
27″	lf	64	10.00	10.30
Flared end sect, RCP, 15″	ea	4	55.00	31.50
24″	ea	2	80.00	60.00
30″	ea	6	110.00	85.00
54″	ea	2	220.00	210.00
27″	ea	4	100.00	85.00

(*Continued on page 246*)

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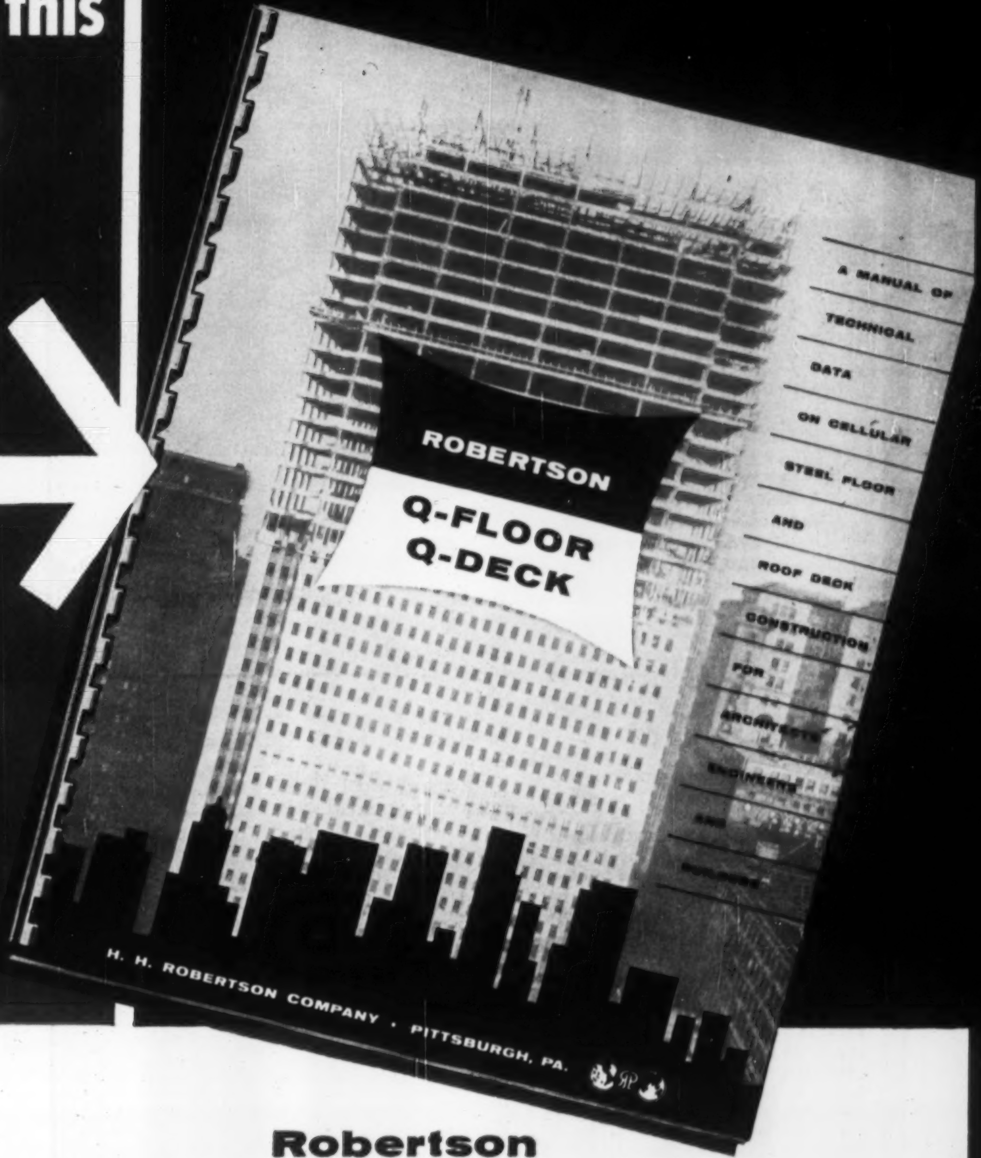
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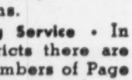

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(Continued from page 244)

Bids: 3-8-57 Items	Unit	Quan- tity	Unit Prices 1 C	 2
Exist culv remov	ls	job	250.00	500.00
Fence, barbed wire	lf	3,100	0.50	0.70
woven wire	lf	3,350	0.60	0.85
Gates	ea	3	100.00	150.00
Fence remov	lf	1,480	0.10	0.25
Numbering & marking	ls	job	6,000	6,750
Lightg sys compl, incl work in exist vault & contr twr	ls	job	41,500	50,000
Arresting barrier compl a	ls	job	10,000	15,000
Topsoiling	acre	102	100.00	225.00
Temporary seeding	ls	job	6,000	2,500
Temporary protection	ls	job	6,000	2,750
Permanent seeding	acre	102	190.00	175.00
Watering	Mgal	714	1.50	3.00

Completion Schedule: April 1957 to Sept 30, 1957
Liquidated Damages: $100 per day

a incl chain slab, control cable to & work in control tower, obstruction lights & connection to runway series circuit, relocation & connection to primary power

Maintenance Hangar, Utilities for A F Base, Louisiana

At $22.18 per sq ft exclusive of concrete floor this 271 ft x 145 maintenance hanger cost includes concrete foundation, structural steel framing, heating, ventilating, air conditioning. The $1,503,521 contract to Henry C. Beck Co., Dallas, Tex. covers in addition utility lines and security fencing. Work is for the Little Rock District, Corps of Engineers, U. S. Army at Barksdale Air Force Base, Shreveport, La.

Concrete floor paving is included with access aprons and concrete drives at $15.85 per cu yd plus $8.18 per cu yd for cement.

Common labor minimum is $1.45 per hour. Skilled workers range from $2.45 to $3.50. This is a 420 calendar-day job.

Six bidders include:

1C	Henry C. Beck Co., Dallas, Tex	$1,503,521
2	J. A. Jones Construction Co., Shreveport, La.	1,517,489
6	King Construction Co., Texarkana, Tex	1,641,160
EE	Little Rock District, Corps of Engineers, Little Rock, Ark. incl profit	1,540,901

Bids: 5-27-57 Items	Unit	Quan- tity	Unit Prices 1C	 2
Demolitions & removals	ls	job	$8,175	$5,000
Excavation, uncl	cy	33,320	1.85	1.575
Maintenance hanger, 271′x145′	ls	job	871,552	883,800
Traffic check house	ls	job	2,300	1,635
Boiler plant & pipe tunnel	ls	job	34,350	32,700
Sanitary sewer lift station	ls	job	8,550	7,400
Elect-distr sys, undergr	ls	job	21,100	20,356
& st ltg sys, aerial	ls	job	41,900	40,346
Manhole, sanitary sewer	ea	15	350.00	252.00
Concrete sidewalk	sy	1,340	4.80	4.62
curbs & gutters	lf	9,193	2.45	2.52
structural	cy	110	93.00	89.25
Water line, 3″	lf	210	3.40	2.415
6″	lf	85	4.25	4.10
8″	lf	1,310	5.10	5.46
10″	lf	590	6.30	6.30
Sprinkler supply line, 20″	lf	3,820	19.20	17.85
Valve & box, 3″	ea	2	110.00	63.00
6″	ea	2	150.00	105.00
8″	ea	1	220.00	157.50
Valve post indicator, 6″	ea	2	120.00	304.50
8″	ea	2	135.00	367.50
Fire hydrant, relocate	ea	5	380.00	367.50
new	ea	2	380.00	236.25
Gas line, 1½″	lf	130	3.20	2.10
2″	lf	370	3.40	2.365
Sanitary sewer, 3″	lf	65	3.10	1.58
3″ CI	lf	40	3.80	2.625
4″	lf	15	3.40	1.58
4″ CI	lf	20	4.40	3.15
6″	lf	270	3.30	2.10
6″ CI	lf	35	4.80	4.20
8″	lf	290	3.40	3.15
8″ CI	lf	173	5.00	5.25
10″	lf	9,360	3.80	4.41
10″ CI	lf	12	6.80	8.40
Conc culv pipe, 15″	lf	810	4.35	4.20
18″	lf	590	5.45	5.25
24″	lf	540	7.60	7.35
36″	lf	255	12.00	11.55
Storm drain pipe, 4″	lf	45	1.10	1.46
4″ CI	lf	20	4.35	2.48
6″	lf	75	1.10	1.33
6″ CI	lf	40	5.00	3.81
8″	lf	120	7.25	7.57
10″ CI	lf	80	8.20	9.28
12″ CI	lf	120	10.60	14.29
15″	lf	70	5.50	4.41
15″ CI	lf	85	20.20	21.15
18″	lf	150	7.60	5.71
18″ CI	lf	30	24.50	18.47
Skimming tank	ls	job	2,700	2,057
CMP sleeves, 15″	lf	240	8.70	11.55
18″	lf	285	9.80	13.65
CMP, 30″	lf	22	9.80	36.75
Misc cast iron	lb	14,600	0.40	0.26
steel	lb	5,600	0.45	0.315
Chain link fence, relocate	lf	870	1.00	1.00
new	lf	772	2.25	2.16
Conc pave, main hangar floor slab, access aprons & conc drives	cy	5,736	15.85	22.00
cement	bbl	8,596	5.45	4.94
Base & filter crse matl	cy	10,700	8.70	8.40
Gravel surfacing	cy	65	7.60	7.35
Bituminous prime coat	gal	1,170	0.30	0.265
matl for pave	t	90	30.00	29.40
surface course	t	1,460	16.50	15.75
Laboratory bldg & services	ls	job	1,250	1,500
Riprap	sy	225	3.25	3.15
Common ryegrass	lb	1,100	0.90	0.84
Fertilizer, avail nitrogen	cwt	9	38.00	36.75
Mulch	t	2	100.00	94.50
Sodding	sy	455	2.20	2.10

Completion Schedule: 420 calendar days
Liiqudated Damages: $200 per calendar day

Air Lift for Landing Strip

The contractor will have to fly or pack in all equipment, labor and materials needed to build Moose Creek Landing Field. It is in a wilderness area of Nezperce National Forest in Idaho where no access route larger than a pack trail is permitted, 25 miles from any one of three staging points. It is one hour of flying time from Missoula, Mont. The existing sod airstrip is 2,600 ft long. DC-3, Ford Tri-motor and other smaller aircraft can use this when flight conditions are right. The $67,103 contract with the Forest Service, Department of Agriculture went to low bidder Henry Vanderwall of Grangeville, Mont. who furnishes all materials. The new strip will be 4,118 ft long.

Wages to be paid on the job include: tractor operators $2.82 powdermen $2.62, timber fallers $2.22, common laborers $2.17. The contractor is allowed 200 calendar days to complete the job with liquidated damages set at $75 per day.

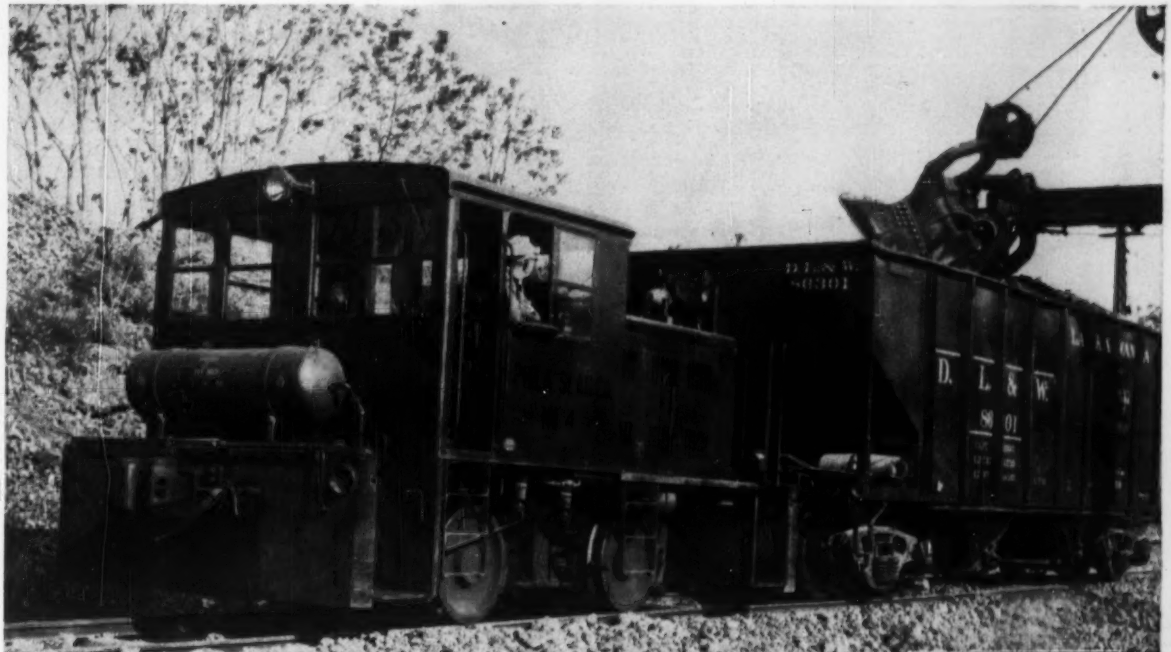
The bidding included:

1C	Henry Vanderwall, Grangeville, Mont	$67,102
2	Dillsworth Construction Co., Helena, Mont	86,612
10	Holzworth Construction Co., Helena, Mont	148,385

Bids: 7-18-57 Items	Unit	Quan- tity	Unit Prices 1 C	 2
Relocate telephone line	mi	1	$300.00	$450.00
Clear & grub	ac	23.33	720.00	900.00
Clear for isolated trees, 1½–4″	ea	200	10.00	10.00
Excavation, unclass	cy	56,520	0.67	0.79
CM culvert pipe, 18″	lf	610	5.00	10.00
CMP underdrain, perf. 8″	lf	650	3.00	7.00
Fence, cl D	lf	7,000	0.45	0.82
Markers, boundary & segm circle	ea	38	45.70	48.00
Airport wind cone, 12 ft	ea	1	250.00	300.00

Completion Time: 8-17-57 start, completion within 200 calendar days
Liquidated damages: $75 per day

(Unit Prices continued on p. 246)



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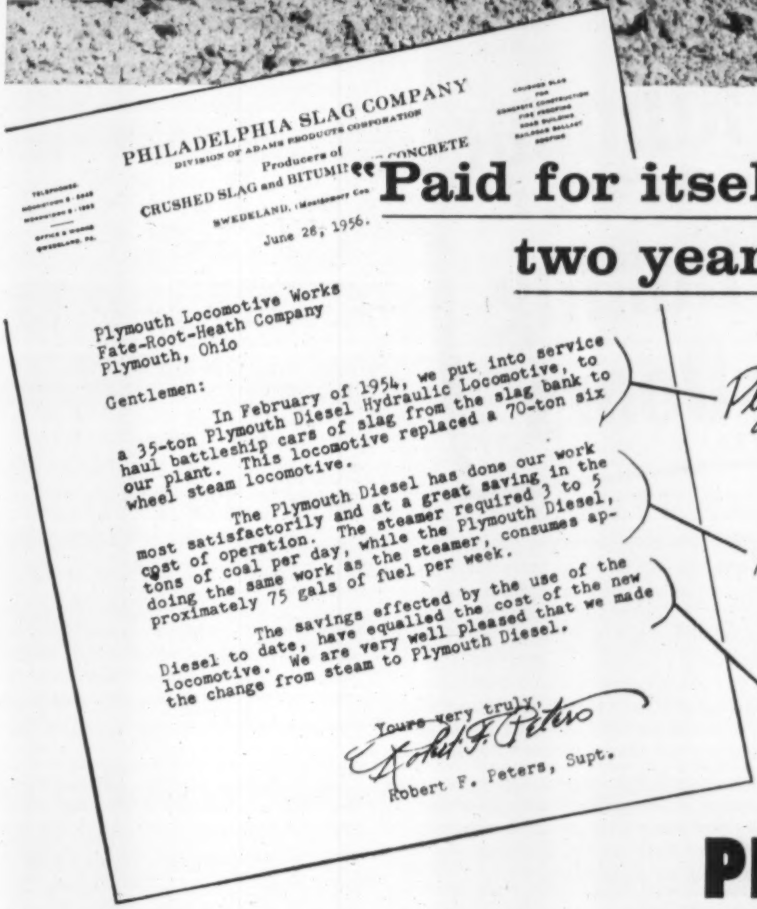

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It might give the impression Kinnear Doors aren't best for *ordinary* needs — which they are.

But in the picture above, note how the traveling crane moves right up to the face of the door. Notice the windows close to the door on either side. Also the steel supports and piping above the doorway. And the way floor and wall space is used clear up to the door jambs.

The Kinnear Rolling Door never gets in their way, and they never impede the door's action.

Because of Kinnear's *coiling upward action,* the whole curtain of interlocking slats coils into a small space above the opening. No usable room is wasted anywhere.

Kinnear *originated* this type of door, more than 50 years ago. It has been industry's first choice ever since.

The rugged all-steel curtain gives extra protection against weather, theft, vandalism and fire. It takes extra years of hard, daily use with minimum maintenance. Accidentally damaged slats can be individually replaced. Heavily galvanized *(1.25 oz. of pure zinc per sq. ft., ASTM standards)* it stands up longer, through toughest weather and climate. Its straight-line design harmonizes with any architectural style or building material.

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Top Speed Needed on Runway Overlay, St. Louis, Mo.

Putting this strengthening overlay on it takes the busy instrument runway at Lambert Municipal Airport out of service. In addition reconstructing the runway intersection restricts the 10,015 ft NW-SE runway to a usable length of some 6,500 ft, leaving only the N-S 6,000 ft runway in uninterrupted service. Thus speed takes top priority, with a 21-day limit on intersection reconstruction not including curing time for concrete and a 90-day limit on putting the overlays into use. Horner & Shifrin, St. Louis are the engineers for the Board of Public Service, St. Louis. Israel Brothers, Inc. of Clayton, Mo. placed the low bid, 9.4% under the second bid and almost 17% under the estimate.

Increased plane loadings and frequency of use both dictate these overlays, a 10 in. portland cement concrete overlay on existing 8 in. concrete runway ends and an 8 in. overlay on existing 7 in. runway interior. For grade adjustment at the intersection a 14 in. pavement is required on soil subgrade. The instrument runway is 200 ft. wide.

Wages in St. Louis range from \$2.40 plus 10¢ fringe benefits for common labor to \$2.50-2.60 plus 7½¢ for truck drivers to \$3.365 plus 7½¢ for tractor operators and \$3.35 plus 10¢ for carpenters.

The bidding ran like this:

1C	Israel Bros. Inc., Clayton, Mo.	$664,903
2	Bangert Bros. Road Builders, Inc. St. Louis, Mo.	735,076
4	Fruin-Colnon Contracting Co., St. Louis, Mo.	810,140
EE	Horner & Shifrin, Consult. Engrs., St. Louis, Mo.	800,000

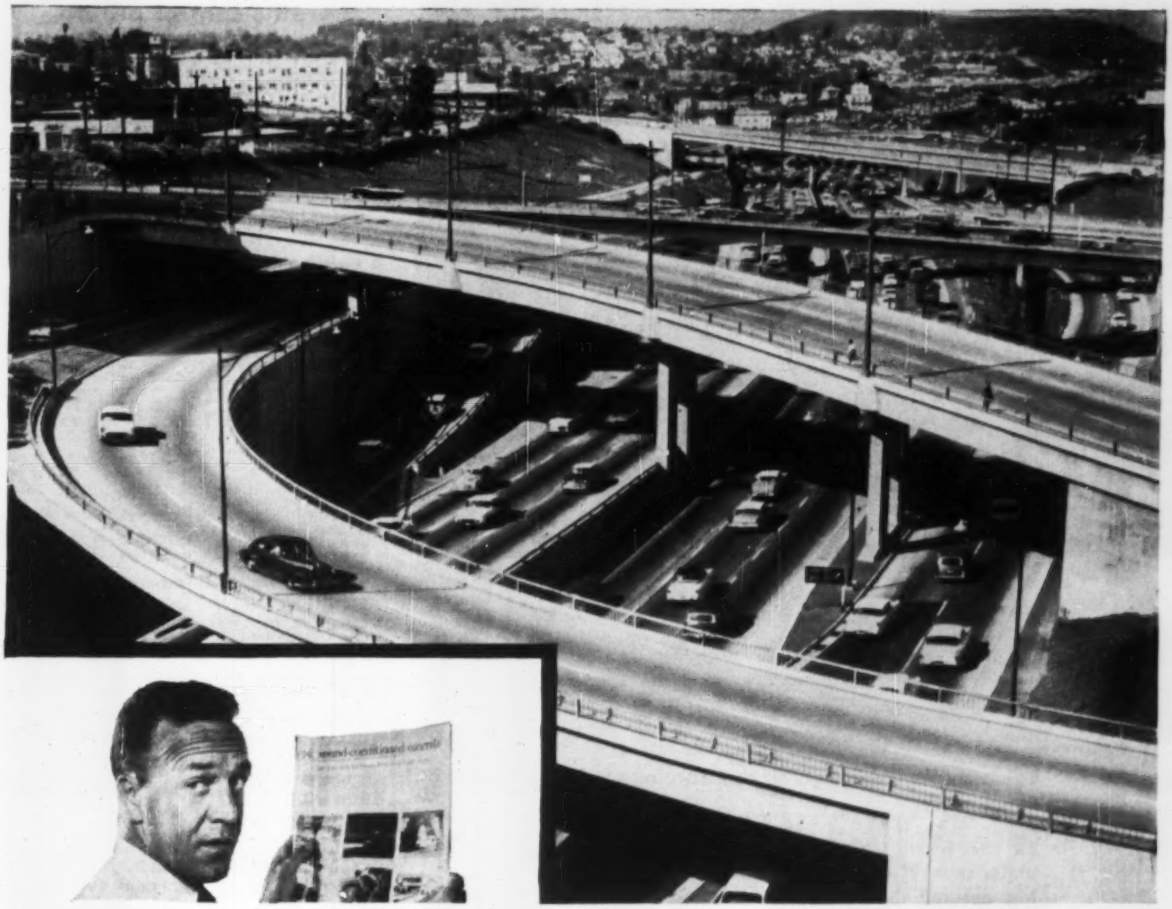
Bids: 7-30-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Remove bit shoulder	ls	job	$3,300	$500.00
conc pave, 7"	sy	4,000	2.10	2.00
8"	sy	700	2.10	2.25
9"	sy	100	2.35	2.60
12"	sy	14,800	2.80	3.00
14"	sy	1,400	3.20	4.00
Prepare subgrade	sy	21,000	0.25	0.10
Borrow excavation	cy	2,000	1.50	1.50
PC conc pave, 8"	sy	77,000	3.87	4.41
10"	sy	17,800	4.56	5.18
14"	sy	18,200	6.30	8.14
extra thick	cy	3,900	18.00	15.00
Clean & reseal exist pave joints	lb	1,800	0.50	1.15
Adj manholes & inlets	ea	36	100.00	50.00
Undergr elect ducts 4-way	lf	460	6.50	5.90
8-way	lf	1,100	12.50	9.80
Crushed aggregate	cy	170	4.00	6.50
Bituminous prime coat	gal	500	0.30	0.30
Asph conc surf course	t	20	12.00	20.00
Runway marking	ls	job	7,000	10,200
Seeding	ls	job	4,000	2,000

Completion Schedule: runway intersection 21 calendar days, total job, 90 calendar days
Liquidated Damages: \$100 per day on either

Traffic Control Changes On Busy City Street

Along a 2 mi. stretch of urban streets with seven intersections traffic signals and street lights will be installed under a \$154,300 contract to Fischback & Moore, Los Angeles. The work must be done without interference to traffic. The project is in Long Beach and Lakewood, Los Angeles County, for the

(Continued on page 250)



Look of the future on newest highways calls for new-type concrete. Shown, interchange in Los Angeles.

What's all this talk about

NEW-TYPE, SOUND-CONDITIONED CONCRETE FOR THE INTERSTATE SYSTEM?

It's timely talk—in a new, informative series of PCA magazine messages to create fuller appreciation by the public for the finer, smoother-riding concrete highways being built today.

Significant advances mark today's newest concrete pavement. Highway engineers know about them. (Actually you may have helped develop them.) But—the *public?* Too few know of these advances . . . now so vital on the new Interstate System.

Take *sound-conditioning.* Admittedly, not a highway engineer's term! But it literally defines what has been done to concrete by use of narrow sawed joints for contraction control. The "thump" sound is gone—a dramatic advance! Drivers enjoy a quieter ride.

There's air-entrainment, too—and the granular subbase: both solved technical problems. But by insuring a lastingly smooth, level surface, they add new pleasure to driving. These and other advances today give people a pavement that is truly *new-type.*

All this needs telling. PCA's new nationwide campaign will do that—in non-technical talk the public can understand. An informed public means an appreciative public. This can simplify your job . . . it can help speed construction of the new Interstate System.

HERE TODAY! MORE COMING!

The public is enjoying new-type, *sound-conditioned* concrete on:

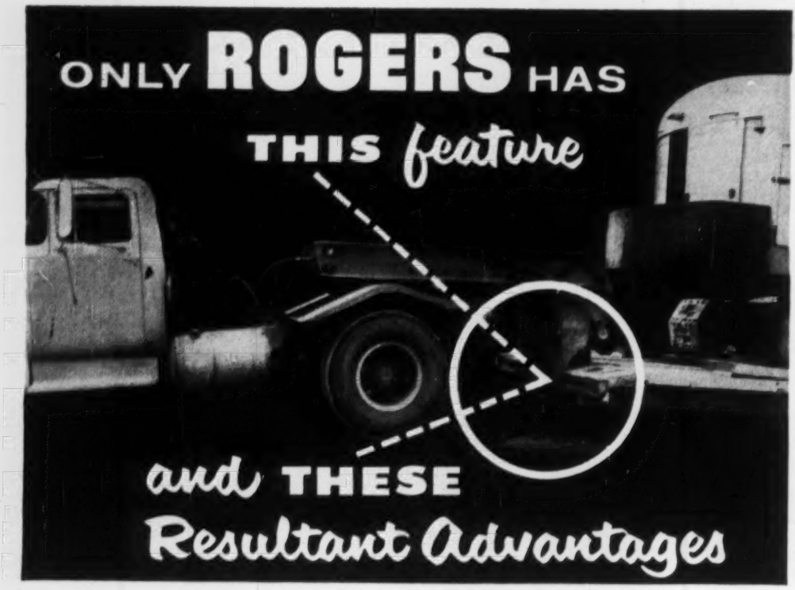
Ohio Turnpike
Atlanta Expressway
Hollywood Freeway
New York Thruway

and more than 3,500 miles of other modern highways.

NEW-TYPE Concrete

PORTLAND CEMENT ASSOCIATION

A national organization to improve and extend the uses of concrete



This exclusive feature makes the Rogers HYDRAU-LIFT *more than* a detachable gooseneck trailer — one, in fact, that performs operations no other trailer can handle.

IT *detaches, loads* and *reloads* in as little as 3 minutes.

IT *loads from the front,* making turning on deck unnecessary.

IT can travel *with deck lowered or raised* to pass under or over obstructions thus avoiding detouring, moving ahead and reloading.

IT can *discharge overhanging loads* quickly and simply.

IT *raises tractor or trailer* wheels, while attached, to easily service tires or attach chains.

ITS *flat, unobstructed gooseneck* provides a convenient place on which to carry dippers, bulldozer blades, etc.

IT *requires no winch,* saving up to $900 in cost and 1000 pounds in overall weight.

EXPERIENCE builds 'em

PATENT NO. 2590210

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ROGERS
"HYDRAU-LIFT" DETACHABLE GOOSENECK
TRAILERS
MORE EFFICIENT—WITH Exclusive Advantages

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Cable Address: BROSITES

. . . Traffic control project

(Continued from page 248)

State Division of Highways, G. Valentine, resident engineer.

Wage rates prevailing range from $2.30 per hr for common labor to $2.40-$2.95 for semi-skilled workers to $3.00-$3.60 for skilled workmen.

The bidding included:

1C	Fischbach & Moore, Inc., Los Angeles Cal	$154,300
2	Westates Electrical Const. Co., L.A., Cal	157,939
4	C. D. Draucker Inc., Los Angeles, Cal	165,896

Bids: 7-25-57 Items	Unit	Quantity	Unit Prices 1 C	2
Remove traffic stripes	lf	20,000	$0.20	$0.08
concrete	cy	30	30.00	16.50
Excavation, roadway	cy	110	20.00	16.50
PMS	t	100	20.00	15.40
Slurry seal coat	sy	61,500	0.13	0.098
Concrete cl B curbs	cy	30	150.00	187.00
Horizontal reflector units	ea	9	50.00	11.00
Remov & reconstr chain linkfence	lf	285	3.00	2.20
Finish roadway	ls	job	750.00	440.00
Raised traffic bars	lf	1200	2.25	2.20
Modify traf sig sys&hwy light loc A	ls	job	15,100	15,456
Traf sig sys & hwy light, loc B	ls	job	17,700	16,056
loc C	ls	job	14,000	15,763
Modify traf sig sys & hwy light, loc D	ls	job	6,000	16,436
loc E	ls	job	9,600	11,967
loc F	ls	job	12,900	12,184
Modify traf sig sys, loc G	ls	job	11,900	10,762
Master control system	ls	job	13,500	19,386
Interconnection	ls	job	27,250	19,036

Completion Schedule: 133 calendar days, 90 working days
Liquidated Damages: $50 per day

Illuminated Highway Signs

These lump sum bids are for structures and frames for six illuminated highway signs in Alameda County, Calif.

The State Department of Public Works, Division of Highways, Sacramento, furnishes paint and sign panels and allows 50 working days to perform the work. Liquidated damages are $50 per day.

The sign structures are steel frames, pole mounted.

Standards are 20 to 22 ft high and frames are from 168 to 504 in. long and 40 to 70 in. high.

Electrical work and guard rail complete this $18,455 contract.

Minimum wages include: electrician $3.375, laborer $2.505, painter $3.10. truck drivers $2.39 to 2.52.

The bidding went like this:

1C	Coopman Electric Co., San Francisco	$18,455
2	Frank Electric Co., Inc., Hayward, Calif	18,637
5	R. Flatland, San Francisco	18,773

Bids: 7-31-57 Items	Unit	Quantity	Unit Prices 1 C	2
Electrical work	ls	job	$4,790	$4,627
Sign structures and frames, 6	ls	job	13,140	13,480
Metal plate guard rail	lf	50	10.50	10.60

Fluorescent Lighting for Subway Platforms

For furnishing and installing 7,000 ft of fluorescent lighting along the platform edge of New York's IRT subway in Manhattan Borough bids taken August 2 ranged from the contract price $182,612 to $197,940 for the second bidder and $259,443 for the high of 12 bidders.

The New York City Transit Authority awarded the work to John G. Hellman Co., Inc. of New York.

This averages $26.09 per lin ft for single pin 72 in. T-12 slimline standard white tubes with lumens output of 3,700 operated at 425 ma.

Time allowed for the job is eight months. Liquidated damages are $100 per day.

Rapid Transit Extension for Cleveland, Ohio

This contract to the Horvitz Co., Cleveland for $440,175 includes two miles of grading for Cleveland Transit System track and one New York Central RR track, also 1,010 ft of retaining walls that range from 10 ft 9 in. to 22 ft high and three passenger tunnels under tracks. Work is for the Cleveland Transit System. Dalton-Dalton Assoc., Cleveland, are the engineers.

The contractor has elected to work ten hours per day for five days and eight on Saturdays to complete the job by November 1, 1957. This is six and a half months ahead of the schedule set by the engineers.

The contractor furnishes all materials. Class A concrete must test at 3,000 psi at 28 days. Cast iron pipe is ASTM A74-42 extra heavy.

Average minimum wages range from common labor at $3.04 to semi-skilled $3.40 and skilled at $3.74.

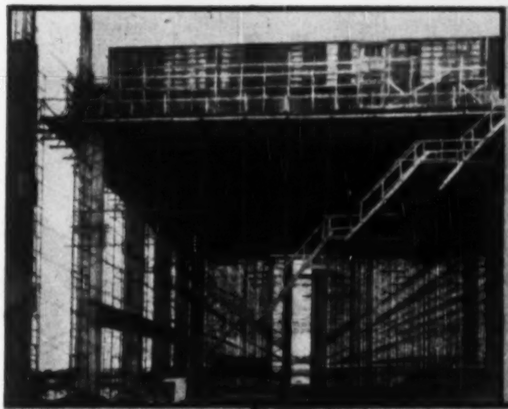
The bidding straddled the engineer's estimate. It includes:

1C	The Horvitz Co., Cleveland, Ohio	$440,175
2	National Eng. & Cont Co., Cleveland, Ohio	454,792
4	The Brodess Const Co., Cleveland, Ohio	487,677
EE	Dalton-Dalton Assoc's, Cleveland, Ohio	470,000

Bids: 6-28-57 Items	Unit	Quantity	Unit Prices 1C	 2
Excavation, common	cy	39,850	$1.65	$1.90
Embankment	cy	4,490	1.10	0.60
Sprinkling	Mgal	125	4.00	4.00
Excavation, structural	cy	8,350	3.50	7.00
Concrete, cl C	cy	1,870	75.00	58.00
Steel, reinf intermed gr	lb	250,000	0.18	0.13
Bit prefrm jnt filler, ¾"	sf	924	3.25	1.00
Waterstops, copper	lb	820	3.25	2.90
Waterproof, 3-ply memb	sf	5,980	0.65	0.50
Conc prot cov, CTS struct 2"	sf	1,237	0.35	0.55
Dampproofing	sf	14,500	0.30	0.35
Backfill, gravel	cy	670	10.00	14.00
sand	cy	250	10.00	10.00
Conc, piers, catnry struct	cy	240	65.00	140.00
Anchor bolts	lb	10,000	0.30	0.11
Steel struct	lb	150,400	0.19	0.19
Electrical work	ls	job	5,500	3,100
CIP drains, 4"	lf	52	5.00	7.00
6"	lf	106	8.00	9.00
CI gratings, 4"	ea	2	1.50	12.00
floor drains, 4"	ea	2	35.00	22.00
CMPP underdrains, 8"	lf	1,463	6.00	6.60
12"	lf	331	8.00	8.90
15"	lf	3,495	9.00	9.40
drains, 12"	lf	38	6.00	9.00
Catch basins, std	ea	16	265.00	200.00
typ brick	ea	1	450.00	350.00
Conc headwalls, tp A	ea	10	100.00	80.00
Remove exist 8" CMPP & constr new 15" (1053 lf)	ls	job	15,000	22,000
Manhole, track drainage 1	ea	1	2,200	1,500
2	ea	1	4,000	4,000
New MH under bridge	ea	2	850.00	1,300
Cast alum safety nosing treads	lf	212	3.00	4.00
Louver escalator pit	ea	1	110.00	140.00

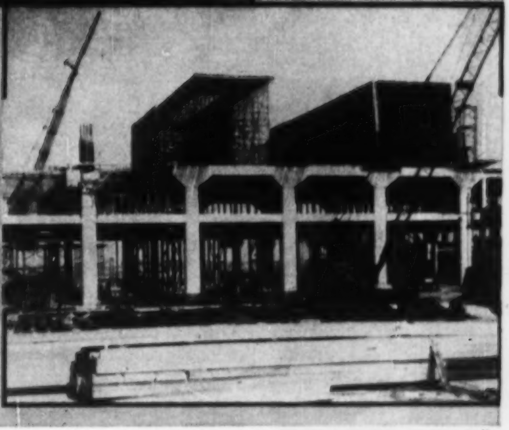
Completion Schedule: 7-15-57 to 5-15-58 Contractor is aiming at completion by Nov. 1, 1957

(Unit Prices continued on p. 254)



BEAVER ADVANCE

TWA Hangar — Kansas City, Mo. MacDonald-Creighton Construction Co., General Contractor



TWA Hangar — Idlewild Airport, N. Y. Joint venture, Grove, Sheppard, Wilson & Kruge; The MacDonald Construction Co., General Contractors

"REPEAT PERFORMANCE BY COMMAND"

Detailing the reasons for superior scaffold performance is easy enough to do, but isn't it easier to *experience exceptional performance* again and again on your own construction jobs?

The ADVANCE scaffold shoring applications illustrated are for TWA hangars, but at widely separated geographical locations. Photo A is a project at Kansas City; Photo B is a similar hangar under construction at New York's Idlewild Airport. The fact that the ADVANCE Shoring System was used at both locations is not mere coincidence. Here's what job superintendents report:

- ADVANCE scaffold assembles faster — replaces as many as 12 wood or steel shores that require twice as much time to place.
- ADVANCE scaffold towers are self-supporting — eliminate additional lateral bracing — greatly reduce nailing requirements . . . afford more freedom of worker movement and assure maximum safety.
- ADVANCE Roller Assemblies enable speedy removal and relocation of forms from one pour area to another with substantial savings in manpower.

These and many more reasons justify "REPEAT PERFORMANCE BY COMMAND." Outstanding *value* makes ADVANCE the accepted name for *quality scaffold, engineering service* and on-the-job PROFITS!

Beaver-Advance CORPORATION
Ellwood City, Pennsylvania

Send for this descriptive catalog, it's FREE!

BEAVER-ADVANCE CORPORATION., ELLWOOD CITY, PA.

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For profitable performance go Gar Wood

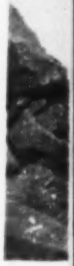
Gar Wood-Buckeye 308 . . . the job-proved standard on grueling cross-country work. Split-shaft excavator drive provides equal power to each drive pinion . . . ends misalignment wear. Hydraulic wheel hoist permits quick adjustment for depth and grade. Simple, grouped controls offer ease of operation. Hydraulic conveyor drive is instantly controlled . . . no complicated shifting . . . never any need to leave the operator's seat!

New Gar Wood ripper is balanced to the power and weight of Euclid TC-12 tractors. Revolutionary swivel-type ripper teeth increase tractor maneuverability . . . save time on turns because they don't have to be lifted out of the ground. Easily and quickly controlled by famed Gar Wood hydraulic system. King-pin construction makes it easy to change pitch of each tooth, adjust for maximum penetration regardless of digging conditions.

Performance, the kind you can depend on regardless of job conditions, demands advanced design as well as quality construction of equipment. You get both when you go Gar Wood!

In excavators, for example, Gar Wood has developed performance features that insure maximum production. Independent chain crowd puts full engine power into every bite on shovel applications. Independent travel lets operator hoist or swing while moving. Direct gear drive and direct manual controls make for fast, accurate control on precision jobs. And just as important, Gar Wood's job-proved heavy-duty construction results in long unit-life with minimum maintenance!

If your work demands performance you can count on, take a *good* look at the complete line of Gar Wood truck equipment and construction machinery. Call your Gar Wood dealer, or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

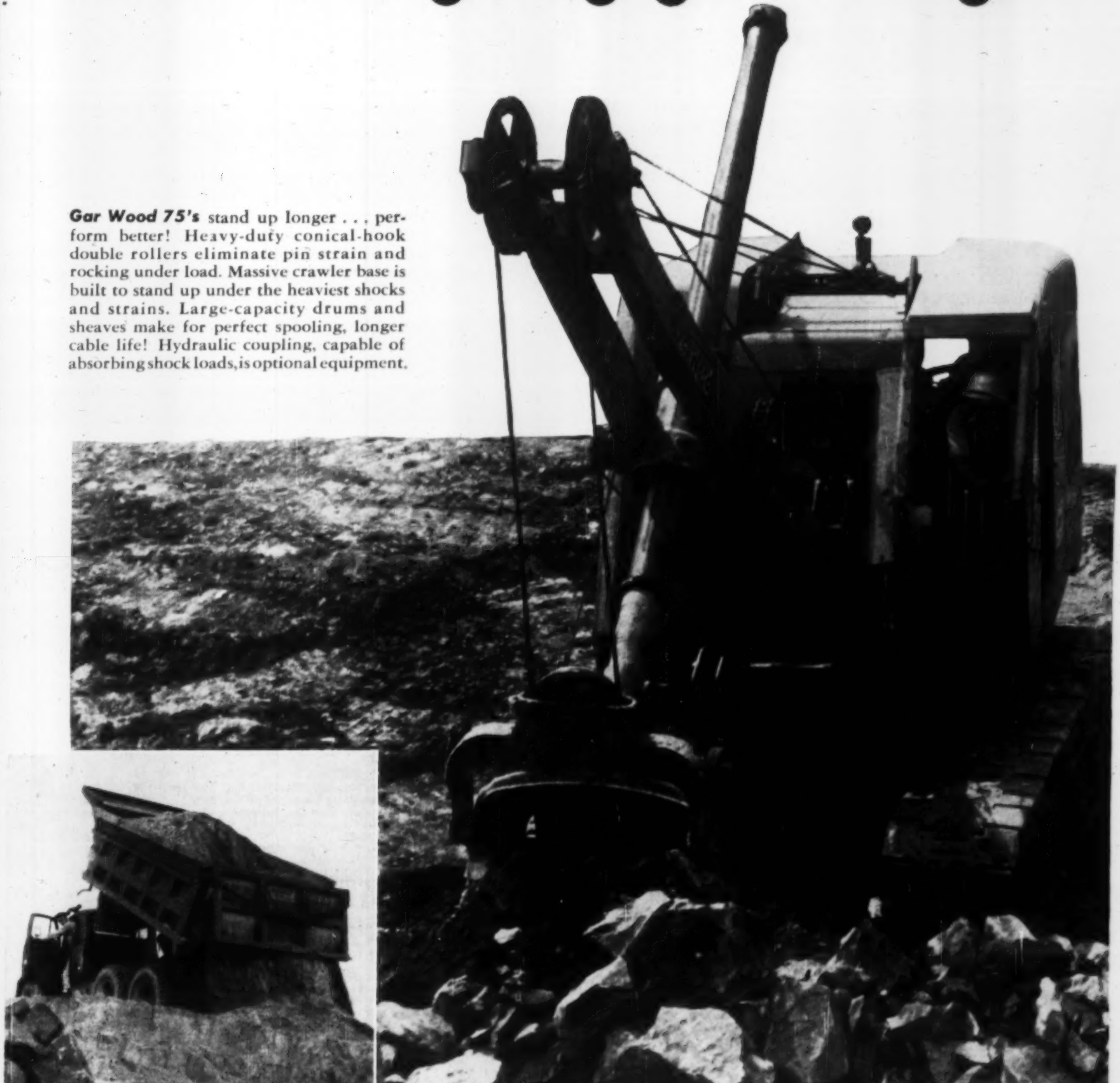


Gar Wood-St. Paul hoists and dump bodies . . . real performance-twins! Integral construction of lift-arms with a torque tube prevents one-sided lifting strains. This means fast, safe dumping . . . even on steep grades! Extra-rugged body construction at critical stress points eliminates spreading, warping or sagging! There's a full line of Gar Wood-St. Paul hoists and dump bodies in all capacities . . . one for your job!

GAR WOOD

PLANTS IN WAYNE AND

when the going gets rough...



Gar Wood 75's stand up longer . . . perform better! Heavy-duty conical-hook double rollers eliminate pin strain and rocking under load. Massive crawler base is built to stand up under the heaviest shocks and strains. Large-capacity drums and sheaves make for perfect spooling, longer cable life! Hydraulic coupling, capable of absorbing shock loads, is optional equipment.

INDUSTRIES, INC.

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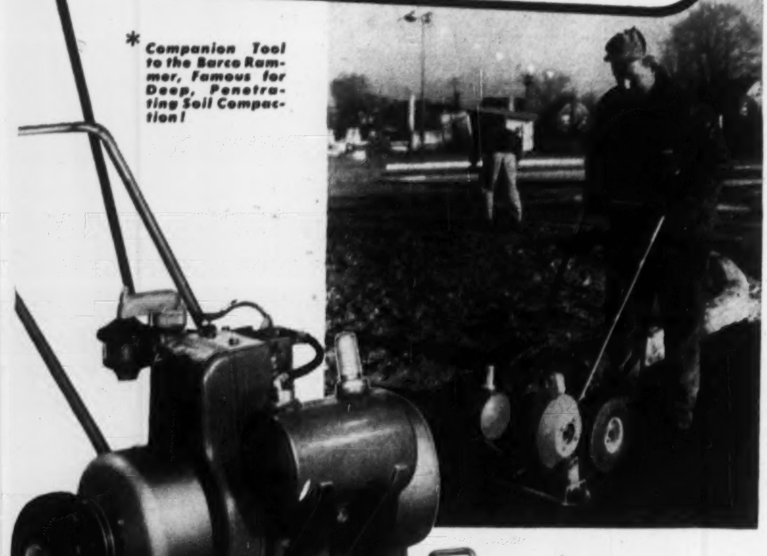
THE NEW BARCO
VIBRA-TAMP*



* Companion Tool to the Barco Rammer, Famous for Deep, Penetrating Soil Compaction!

A Versatile Tool for MAXIMUM COMPACTION of

1. Granular Base Materials
2. Bituminous Surfacing

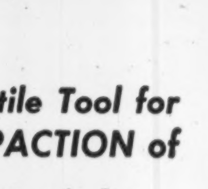
EFFICIENT—one man does the work of many with VIBRA-TAMP. Operates in any weather. Works flush against curbs, foundations, and walls.

ECONOMICAL—to buy, operate, and maintain! No special tools required. Saves your bigger, costlier equipment. Tamp up to 750 sq. yds. per hour.

SAFE—moving parts fully enclosed. Special vibration dampers reduce operator fatigue. Simple controls. Handle adjustable to comfortable height.

DURABLE—simple design and quality construction keep VIBRA-TAMP on the job day in and day out. Carburetor unaffected by vibration.

VERSATILE—use VIBRA-TAMP for all kinds of work—wherever low cost is a prime consideration. Take VIBRA-TAMP on the big jobs for hard-to-reach areas. Use it for patching streets, driveways, and roads. VIBRA-TAMP has no economy equal—a real work-horse on sand, gravel, soil, chippings! *Ask for new catalog No. 630.*



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BARCO *Serving Industry Since 1908*
MANUFACTURING COMPANY, 514L Hough St., Barrington, Ill.

Steel Girder and I-Beam Spans, Penna.

Construction of this 19-span steel girder bridge and a 2-span I-beam bridge involves an overall length of 3,343 lin ft. The $4,122,666 contract to Harris Structural Steel Co., Inc., New York, covers in addition a 55 ft I-beam bridge, approximately 2,158 lin ft of divided highway, 24 ft reinforced concrete pavement on each side of concrete divisor and construction of ramps and service roads.

Close bidding put the low 2½% under the second and only 4.6% under the high bid.

The substructure contract to Brayman Construction Co. of Pittsburgh at $2,227,595 was 6% under the second bid and almost 33% below the high of five bidders.

Let by the Department of Highways, Commonwealth of Pennsylvania, Harrisburg, the job is in Harrisburg, Lemoyne Borough, Dauphin-Cumberland Counties. It is scheduled to take 375 working days.

Minimum wages are set to include: carpenters $2.50, laborers $1.60, power equipment operators, shovels and cranes $2.80, tractors $2.40, truck drivers $1.425 to $1.90.

The State sets also these minimum equipment requirements: four 2½ yd power cranes, one 1 yd power shovel with crane boom, one 10 t and one 3-6 ton power roller, one 27 E paving mixer or transit mix plus "sufficient" electric welding outfits, pneumatic drills, riveters, compressors, jack-hammers, pumps.

The bidders include:

1C	Harris Structural Steel Co., Inc., New York	$4,122,666
2	United States Steel Corp., Phila, Pa	4,238,378
4	Bethlehem Steel Co., Bethlehem, Pa	4,323,198

Bids: 5-24-57 Items	Unit	Quantity	Unit 1C	Prices 2
Superstructure				
Excavation, cl 1	cy	163	$6.00	$8.00
Subgrade	sy	651	1.00	0.30
special	sy	25,667	1.00	0.80
Shoulders	lf	277	1.00	1.00
Base crse, cr agg, tp B, 9"	sy	138	3.00	2.30
6"	sy	3	2.00	3.00
Stabilized shoulders	lf	3,544	4.00	1.50
Select matl surf, stone	cy	159	8.00	6.00
Plain cmt conc pave, 6"	sy	648	6.00	6.50
Reinf cmt conc pave, 9"	sy	7,956	6.75	6.50
10"	sy	12,147	7.25	7.20
Bit surf crse ID-2, 2½"	sy	138	8.00	2.50
1½"	sy	3	8.00	6.00
Conc, cl A, stone agg	cy	5,240	76.00	91.00
Steel, reinf bars	lb	1,580,000	0.135	0.16
fab struct	lb	10,650,000	0.302	0.3015
Parapet railing, aluminum	lf	6,565	5.00	8.00
Curb, white conc reflect, tp B	lf	4,327	2.50	2.00
plain cmt conc	lf	2,955	2.50	3.00
Cmt conc sidewalks	sy	279	5.00	7.00
Guard fence, tp 1-C	lf	1,328	1.50	1.50
Anchorage, tp C end	ea	7	70.00	65.00
Bridge lighting system	ls	job	19,000	23,000
Barrier median	lf	3,335	5.00	7.00
special	lf	50	7.00	10.00
aluminum railing	lf	163	70.00	11.00
Guard fence connections	ea	2	100.00	90.00
Seeding & soil supplements, slope mix	sy	15,950	0.05	0.04
berm mix	sy	4,628	0.05	0.04
Mulching, hay	sy	20,578	0.05	0.05

Completion Schedule: 375 working days
Liquidated Damages: $300 per day

(Continued on page 256)

How Many Have You Traveled?

64 of America's Expressways Benefit from Armco Products

Typical expressway using Armco Products

Here is a good indication of the nation-wide acceptance of Armco Products for highway construction and drainage. Armco Products are installed on practically every major expressway in the country (see list on this page).

Obviously, Armco Products had to meet specifications. But more important, they offered one or more advantages . . . lower cost, easier or faster installation, better delivery, more durability or greater strength.

Which Products Do You Need?

In general, Armco Products consist of drainage pipe in the world's widest selection of types, sizes, shapes and coatings. They also include foundation piling, guardrail, retaining walls, tunnel liner plates, steel buildings, bridge plank, steel sheeting and end sections for the highway market. Write us for literature and other data on these products. Armco Drainage & Metal Products, Inc., 3307 Curtis Street, Middletown, Ohio. In Canada: write Guelph, Ontario, Export: The Armco International Corporation.

Armco Products Have Been Installed On All of these Expressways

Alameda & San Joaquin County, U.S. 50
Altamont Pass
Atlanta Expressway
Augusta Expressway
Boston Circumferential Highway
Broadway Bridge & Expressway
Brooklyn-Queens Expressway
Calumet Expressway
Congress Street Expressway
Connecticut Turnpike
Dallas Expressway
Dallas-Ft. Worth Turnpike
Davison Expressway
Dennis Roberts Expressway
Denver-Boulder Turnpike
Eden Expressway
El Dorado County, U.S. 50
Everett to Spokane, U.S. 2
Garden State Parkway
Golden State Freeway
Harbor Freeway
Hollywood Freeway
Houston Expressway
Indiana Toll Road
Jacksonville Expressway
Kansas Turnpike
Kentucky Turnpike
Long Beach Freeway
Long Island Expressway
Maine Turnpike & Extension
Massachusetts Turnpike
Merritt Parkway
Muncie Expressways
New Hampshire Turnpikes
New Jersey Turnpike & Extensions
New Orleans Expressway
New York Thruway & Extensions
Ohio Turnpike
Pasadena Freeway
Paseo Bridge & Expressway
Penn-Lincoln Parkway
Pennsylvania Turnpike & Extensions
Port Angelos to Chinook, U.S. 101
Port Arthur Expressway
Queen Elizabeth Way
Rhode Island Expressway
Roseville-Sacramento Freeway
San Bernadino Freeway
San Diego Freeway
Santa Ana Freeway
Schuylkill Expressway
Seattle to Spokane, U.S. 10
Shasta County, U.S. 99
Sunshine State Parkway
Tacoma to Clarkston, U.S. 410
Trans-Canada Highway
Tri-State Highway
Turner Turnpike & Extensions
Valley Highway
Van Brunt Parkway
Vancouver to Bellingham, U.S. 99
Ventura State Freeway
West Virgina Turnpike
Wilbur Cross Parkway

Armco Construction Products

ARMCO ®

CUT HANDLING COSTS!
WEST SYSTEM AND EQUIPMENT
KEEPS MASONRY MATERIALS ON THE MOVE!

This West SKYTRAK "445" is "on-the-job" at the Dow Chemical Company's new Administration Center, Freeport, Texas, for the Herman L. May Masonry Co., of Houston . . . proving its versatility and ability to cut costs.

Mr. May, owner of the "SKYTRAK" states:

"We are well pleased with the West Equipment — it has worked out much better than anticipated, reducing attending labor by 50% over normal operations. Also, we were able to keep going on many days where ordinary operations would have shut down because of heavy rains. In addition to handling brick and mortar, all scaffolding and planks were moved with the Skytrak Front-end Hydraulic Lift."

HALF BRICK BUGGY
STANDARD BRICK BUGGY

FOR COMPLETE DETAILS . . . CALL OR WRITE

WEST
BRICK BUGGY CORPORATION
4310 Mayfield Road Cleveland 21 Ohio
Phone: EVergreen 1-9468

. . . Girder and beam spans

(*Continued from page 254*)

Superstructure

1C	Brayman Constr Co., Pittsburgh, Pa.	$2,227,595
2	Booth & Flinn Co., Pittsburgh, Pa.	2,377,896
5	J. Richard Nissley, Inc., Landisville, Pa.	3,331,104

Bids: 5-24-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Clear & grub	ls	job	$50,000	$3,000
Excavation, cl 1	cy	66,356	1.60	2.00
cl 2	cy	2,159	6.00	7.00
cl 3	cy	3,774	16.00	20.00
cl 3A	cy	2,474	40.00	30.00
Aggregate, 2B coarse	cy	19	10.00	8.00
Conc, cl A	cy	626	50.00	50.00
cl A, stone agg	cy	1,540	50.00	40.00
cl B	cy	4,240	45.00	35.00
Steel, reinf bars	lb	396,351	0.13	0.15
fab struct	lb	217,422	0.25	0.25
Parapet rail, aluminum	lf	695	10.00	5.00
Stone, backfill, struct	cy	162	8.00	10.00
misc drng	cy	294	8.00	5.00
Membrane waterproofing	sy	174	5.00	2.00
Mortared stone slope wall, spec	cy	415	40.00	25.00
Cmt conc pav, stream beds, cl B 6"	cy	11	40.00	60.00
Inlets, tp 4'	ea	3	400.00	350.00
spec	ea	3	400.00	420.00
tp H	ea	1	400.00	450.00
J	ea	1	400.00	350.00
Manholes, rebuilt	vf	6	50.00	20.00
castings reset	sets	2	50.00	10.00
CIP, 8"	lf	94	10.00	12.00
4"	lf	235	8.00	6.00
CMP arch, A ct, 18"x11"	lf	12	6.00	6.00
RCCP, 15"	lf	116	5.00	4.00
18"	lf	488	5.50	5.00
24"	lf	117	7.50	7.00
18", OJ, or ESVCP, OJ or perf asp ct CMP	lf	368	5.50	4.50
Pipe fdn undrdrn, tp A, 6" tp I backfill	lf	990	2.80	2.00
tp II backfill	lf	3,713	2.80	2.00
Pipe undrdrn outlets, 6"	lf	358	2.80	2.00
Crse agg, ex depth undrdrn	cy	4	10.00	8.00
Anchorage, tp C end	ea	1	100.00	70.00
Spec rock faced ashlar mas, piers I to XXI	cy	19,000	75.00	87.00
west abutment	cy	140	90.00	200.00
Elec conduit, 2"	lf	120	4.00	10.00
Guard fence connections	ea	5	80.00	100.00

Completion Schedule: Start 7-5-57, Complete 290 working days. Liquidated Damages: $300 per day

Street Interchange Bridge Awarded in West Virginia

A $350,000 concrete beam and steel beam interchange bridge in Harrison County, W. Va., drew seven bids with the contract going to Monty Bros., St Albans. Work is for the State Road Commission, Charleston.

The bidding included:

1C	Monty Bros., St. Albans, W. Va.	$344,918
2	J. M. Francisa & Co., Fayetteville, W. Va.	384,296
7	Agnew-Joseph Co., Ronceverte, W. Va.	486,097

Bids: 8-6-57 Items	Unit	Quantity	Unit Prices 1 C	 2
Clear & grub	ac		$200.00	$500.00
Excavation, structure	cy	3,004	4.00	5.00
rock	cy	312	15.00	30.00
Wrought iron pipe 6"	lf	783	20.50	23.00
Conc cl A superstr	cy	1,192	75.00	80.00
substr	cy	1,467	55.00	60.00
Metal railing	lf	1,130	12.00	14.00
Steel reinf bars	lbs	503,634	0.14	0.15
Dampproofing	sy	331	2.00	2.00
Steel, superstr 221,265 lbs	ls	job	56,955	65,000
spiral reinf bars	ls	job	200.00	1,000

Completion Schedule: 200 working days

Speedway Underpass & RR Shoofly, Arizona

This job in Pima County, northwest of Tucson, Ariz. extends from West Speedway to the Tucson Controlled Access Highway. Drainage will be a major problem to the contractor, San Xavier Rock & Sand Co., Tucson, whose $543,972 bid was within 1½% of the state's estimate but 6% under the second bidder. Work is for the Arizona State Highway Commission, L. S. Waggoner, resident engineer.

In addition to grading, draining, aggregate base, bituminous plant mix and plant mix seal coat are a 2-span steel girder underpass and two 2-span concrete slab structures, a pumping and lighting system and a railroad shoofly.

Class A concrete requires 6 bags of cement per yard and must test at 2,500 lb compressive strength in 28 days. Cast iron sewer pipe must meet Federal specifications WW-P-421 Cl 150.

Bidders include:

1C	San Xavier Rock & Sand Co., Tucson, Ariz	$543,972
2	The Ashton Co., Inc., Tucson, Ariz	569,997
5	Givens Constr Co., Phoenix, Ariz	630,497

Bids: 5-3-57 Items	Unit	Quantity	Unit Prices 1C	 2
Excavation, roadway	cy	45,600	$0.51	$0.50
structural	cy	7,570	2.00	2.00
Water, provide supply	ls	1	500.00	500.00
apply cip	Mg	1,100	1.60	1.75
Rolling	hr	210	9.00	8.50
Select material cip	t	11,700	0.90	1.00
Aggregate base cip	t	3,040	1.90	2.00
Bit mix, Cl II-PM cip exc pav asph	t	1,870	3.80	5.00
Seal coat, PM exc pav asph	t	385	6.50	8.00
Pav asph, bit mix & PM seal coat, gr 120-150 pen		95	40.00	45.00
Liq asph, pr ct, MC2 or MC3	t	24	47.00	55.00
first tack ct	t	6	85.00	65.00
Emuls asph, 2nd tack ct gr A	t	6	85.00	65.00
Conc pave, integral curb	sy	6,100	5.25	5.50
Steel structural	lb	569,600	0.153	0.16
Pipe handrail	lf	511	8.85	8.00
Concrete, cl A	cy	4,443	40.50	41.00
cl D	cy	492	45.00	42.50
Steel, reinf bars	lb	487,700	0.122	0.14
Perf CMP, incl sand backfill, 6"	lf	1,560	2.25	1.50
RCP, 30"	lf	265	12.35	14.00
Misc removal & other work	ls	1	3,500	1,500
Road guard, std C-7 tp B	lf	30	6.00	5.00
precurved	lf	60	6.60	5.00
special	lf	38	7.45	5.00
Curb, single std C-20 tp G	lf	2,980	1.55	2.00
Comb curb & gutter, std C-20 tp A	lf	1,560	2.15	3.00
Concrete sidewalk	sf	3,300	0.45	0.40
MH incl fr & cov, std C-30 1	ea	7	235.00	300.00
2	ea	3	240.00	400.00
Reset	ea	1	65.00	100.00
Lighting sys, highway f&i	ls	1	28,000	30,000
CISP, 8"	lf	198	4.75	10.00
Grates, drain struct	ls	1	2,800	3,000
Remove shoofly embank't	ls	1	1,800	1,000
Pumping sys compl f&i	ls	1	8,500	10,000
VCP, 6"	lf	515	1.85	4.00
8"	lf	410	2.55	4.50
10"	lf	497	3.60	6.00
10" encased conc	lf	60	7.15	12.00
F, pl & remov shoofly ballast	ls	1	15,000	14,000

Completion Schedule: 5-18-57 to 5-31-58
Liquidated Damages: Engineering costs incurred on any unapproved extension of time.

Prestressed Decks for City Bridges, Highland Park, Ill.

These four bridges will have precast pretensioned prestressed concrete deck units 3' x 17" with 2 Sonovoids, three 40 ft spans each and 24 ft roadway with 3'10" sidewalks on each side. Suter & Sommerschield, Chicago, are the consultants for the City of Highland Park, Lake County, Ill.

The contract to Keno Construction Co., Inc., Highland Park at $359,408 is under the original low bid of $366,615 and over the adjusted bid of $338,472 in which a number of items were omitted.

Class X is 6-sack, 3,500 psi concrete.

Wage rates in the area include:

(*Continued on page 258*)

LESS
Effort·Motion·Fatigue

plus

MORE
Control·Comfort·Speed

equal

INCREASED
Production·Profits

with LORAIN 2-Lever, "JOY STICK" POWER CONTROLS

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You'll want to see and try this newest of all ideas for shovel-crane operating control. Ask your Thew-Lorain Distributor to explain — and demonstrate — the new Lorain "Joy Stick" advantages!

THE THEW SHOVEL CO., Lorain, Ohio, U. S. A.

Lorain 2-Lever, "Joy Stick" Power Controls are available for all classes of Lorain Crawler and Rubber-Tire Shovels, Cranes, Hoes, Draglines and Clamshells.

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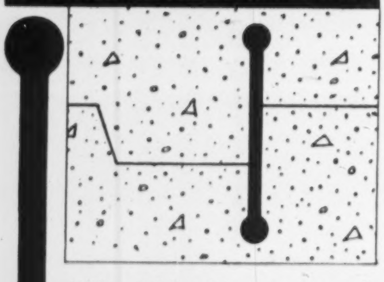

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See Sweet's, or Write for Information.

WILLIAMS
EQUIPMENT and SUPPLY CO.
6001 E. McNichols Rd., Detroit 12, Mich.

. . . Highland Park Bridges

(Continued from page 256)

carpenters $3.35 + 10¢ fringe benefits, structural ironworkers $3.55 + 7½¢, common laborers $2.575 + 7½¢, crane operators $3.60 + 5¢.

Bidders included:

1C	Keno Constr Co., Inc., Highland Park, Ill	$366,61
	Adjusted to $338,472 Contract let at	359,40
2	States Improvement Co., Inc., Maywood, Ill	372,74
4	Telander Bros. Contractors, Inc., Chicago, Ill	434,70
EE	Suter & Sommerschield, Chicago, Ill	350,00

Bids: 5-20-57 Items	Unit	Quan-tity	Unit 1C	Prices 2
Bridges, remov 4 exist	ls	job	$11,000	$20,000
Conc cl x	cy	1,878	75.00	85.00
Steel reinf	lb	271,530	0.13	0.15
Conc deck units prestressed	sf	13,670	8.00	7.00
Corr pure iron pipe 8"	lf	740	4.50	4.00
12"	lf	761	5.00	4.00
perforated 8"	lf	554	4.50	4.00
Drainage inlets A	ea	22	125.00	150.00
B	ea	8	125.00	150.00
Catch basins	ea	8	225.00	200.00
Headwalls	ea	8	175.00	200.00
Maint exist sani sewer	ea	4	250.00	300.00
reloc	lf	560	9.25	5.00
Sanitary manholes	ea	6	260.00	200.00
Compacted fill	cy	4,003	2.00	3.00
Concrete sidewalk	sy	201	7.00	5.00
Macadam base crse, water bound	sy	1,155	2.75	2.00
Conc surf crse, bit	sy	2,915	1.75	1.00
Aluminum handrail	lf	1,470	12.00	9.00
Conc curb & gutters	lf	1,020	4.00	2.50
Name plate plaques	ea	4	75.00	100.00
Valve vaults	ea	1	140.00	200.00
Exist water serv, maint	ea	1	200.00	500.00
relocat	lf	200	9.50	3.00

Completion Schedule: 200 working days

Indiana Bridges Include Arch, Slabs, Girders

These three contracts include five bridges and a box culvert, all on skews. The 30 ft reinforced concrete arch award for $93,808 to Moellering Construction Co., Inc., Fort Wayne, included an 18 ft square reinforced concrete slab culvert, both under fill with width of 50 ft. Class D concrete requires 6 bags of cement, Class E 5 bags. Minimum wages range from $1.25 for common labor to $1.35 for semi skilled and $1.50 per hour for skilled.

This is how the prices ran on this variety of structures:

Reinforced Concrete Arch, 30 ft span, 30° Skew, Also Square Slab Culvert, 18 ft span, 44 ft Roadway

1C	Moellering Const. Co., Inc., Fort Wayne, Ind	$93,808
2	Lee Pickel Const. Co., Hillsboro, Ind	98,500
3	Berg Construction Co., Fort Wayne, Ind	107,713
EE	State Highway Dept. of Indiana, Indianapolis	100,755

Bids: 8-6-57 Items	Unit	Quan-tity	Unit 1 C	Prices 2
Concrete, cl D	cy	76.8	$74.50	$80.00
cl E above footings	cy	186.8	74.50	70.00
cl E in footings	cy	91.4	74.50	50.00
Steel, reinforcing	lb	50,367	0.14	0.15
Cast iron	lb	230	0.60	0.60
Excavation, wet	cy	663	13.60	15.00
waterway	cy	550	0.80	1.00
common	cy	200	0.80	1.00
Special borrow	cy	2,220	1.25	1.50
grade B	cy	2,565	2.75	2.50
Sodding	sy	1,080	0.60	0.60
Mulched seeding	sy	2,270	0.20	0.16
Pavement, RCC	sy	1,494	5.50	6.00
Remove exist struct	ls	1	800.00	2,500
Temp br & appr	ls	1	3,700	6,500
Warning signs	ea	12	50.00	80.00
Barricades, std, tp A	ea	2	100.00	100.00
Conc, struct, cl D	cy	296.2	79.00	78.00
R/W markers	ea	6	7.00	9.00
Paved side ditch, tp A	lf	480	2.00	3.25
B	lf	70	3.50	3.75
C	lf	85	4.00	4.25
Joints, pave contr	lf	352	1.50	1.30
Guide posts, wood	ea	24	5.00	7.00
Pipe, cl 5, 24"	lf	24	8.00	8.50
18"	lf	20	4.50	4.25
Drain tile, 6"	lf	115	2.00	2.20

Two Reinforced Concrete Girders, each 3 Spans at 36 ft, One Skew 40°L, one 30°L, one 30 ft 6 in. Roadway, one 30 ft Roadway, two 2 ft Walks Each

1C	DeBolt Const Co., Inc., Richmond, Ind	$153,712
EE	State Highway Dept of Indiana, Indianapolis	160,039

Bids: 8-6-57 Items	Unit	Quan-tity	Unit 1 C	Prices EE
Concrete, cl F	cy	533.3	$85.00	$80.00
E above footings	cy	95.6	75.00	70.00
E in footings	cy	79.4	65.00	65.00
railing	lf	508.9	12.00	12.00
Steel reinf	lb	156,995	0.14	0.15
Cast iron	lb	333	0.70	0.75
Piles, untr timber furn	lf	1,520	0.90	1.00
driven	lf	1,216	0.90	0.80
furn equip to drive	ls	1	100.00	400.00
Excavation, wet	cy	325	15.00	18.00
waterway	cy	560	1.00	1.00
common	cy	2,290	0.60	1.00
Special borrow	cy	5,425	0.80	1.00
grade B	cy	1,760	2.30	2.00
Sodding	sy	910	0.60	0.65
Mulched seeding	sy	2,825	0.15	0.20
Reinf cem conc pavement	sy	1,086	6.50	6.50
thickened	sy	352	7.50	7.00
Aggr, comp aggr base	t	218	5.00	5.00
Remove exist struct	ls	1	500.00	2,000
Temp br & appr	ls	1	9,000	7,500
Warning signs	ea	24	50.00	85.00
Barricades, std, tp A	ea	4	100.00	100.00
Concrete, struct, cl D	cy	1.8	90.00	80.00
R/W markers	ea	3	10.00	10.00
Furn equip, dr pile	ls	1	100.00	400.00
Remove exist struct	ls	1	2,500	3,500
Steel pile shells furn	lf	990	6.00	6.00
drive	lf	990	3.00	4.00
Hot asph conc binder	t	10	16.00	16.00
Pave, CC, plain, temp 6"	sy	899	6.00	6.00
break	sy	304	0.50	0.50
remove	sy	177	1.00	1.20
Paved side ditch, tp A	lf	220	3.50	3.50
C	lf	93	5.00	4.50
G	lf	180	9.00	7.50
Joint, 1" exp	ea	189	1.00	1.20
Guide posts, wood, tp A	ea	19	7.00	8.00
Guard rail, steel beam	lf	220	4.00	4.00
Aggr, subsurf drains	cy	42	6.00	10.00
Slopewall	sy	622	5.00	6.50
Pipe cl 5, 12"	lf	156	3.50	3.50
24"	lf	46	8.50	9.00
6", subsurf drains	lf	602	1.25	3.00
Joints, pave contr	lf	300	1.40	1.50

Completion Schedule: 8-15-57 to 3-1-58

Continuous Reinforced Concrete Slab Bridge, Spans 21-28-21 ft, Skew 15°R 24 ft Roadway

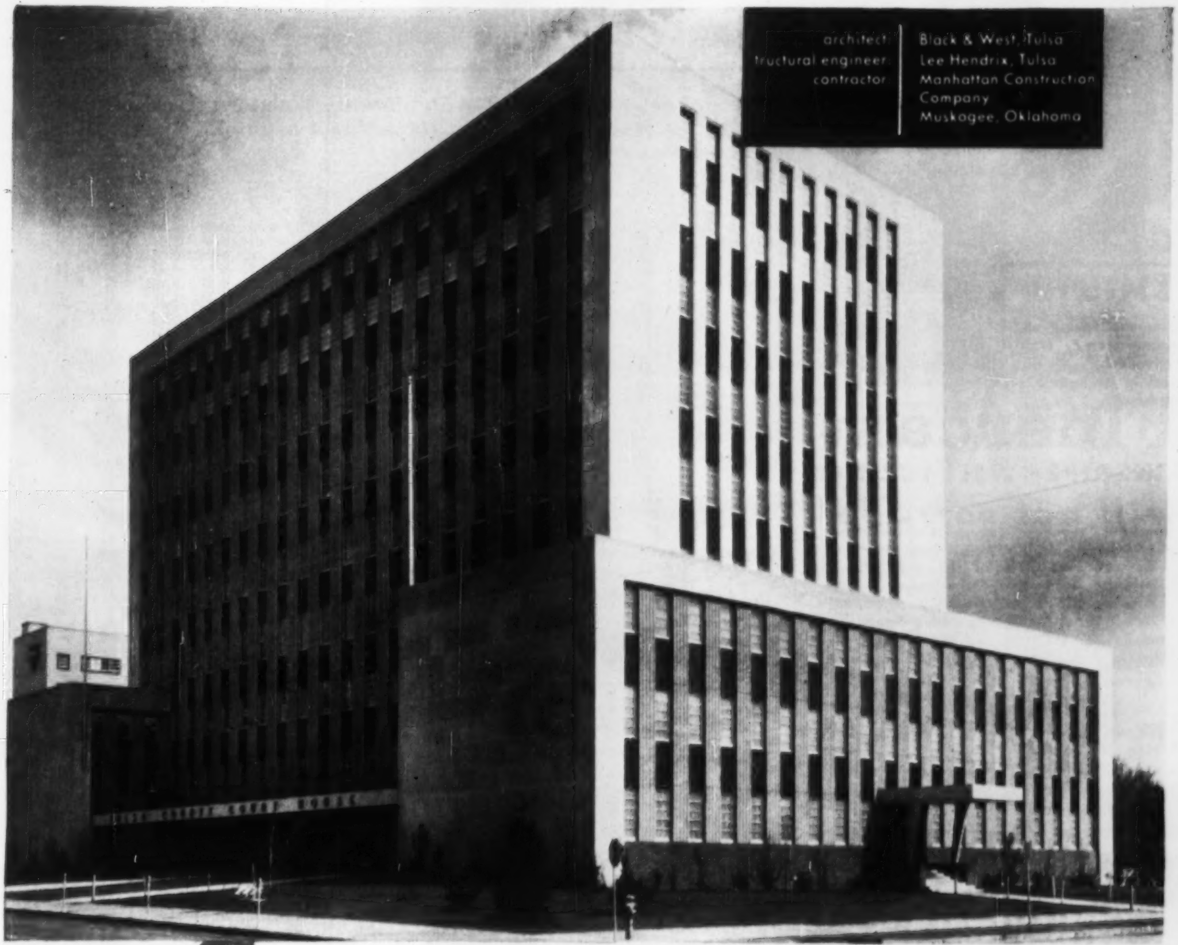
1C	Lee Pickel Const Co., Hillsboro, Ind	$28,737
2	McKeand & Johnson Inc., Anderson, Ind.	29,612
EE	State Highway Dept of Indiana, Indianapolis	30,909

Bids: 8-6-57 Items	Unit	Quan-tity	Unit 1 C	Prices 2
Concrete, cl F	cy	117.8	$82.00	$80.00
railing	lf	146.0	12.00	13.00
Steel, reinf	lb	20,605	0.15	0.15
Cast iron	lb	300	0.60	0.75
Furn equip, pile driving	ls	1	750.00	850.00
Excavation, waterway	cy	300	1.00	1.50
common	cy	35	1.50	1.50
Special borrow, grade B	cy	50	3.00	3.00
Aggr. for comp. aggr base	t	278	5.00	4.50
Remove exist structure	ls	1	2,500	3,500
Warning signs	ea	6	80.00	80.00
Barricades, std, tp A	ea	2	100.00	100.00
Steel pile shells furnish	lf	560	6.00	7.00
drive	lf	560	4.00	3.00
Slopewall	sy	265	5.75	6.00
Hot asph conc binder	t	61	16.00	12.00
Bit material for prime	t	1.3	80.00	45.00
Aggr, shoulder drains	t	4	7.00	15.00

Terrazzo Paving, Detroit

Rustic Venetian terrazzo pavement and concrete subbase at the Center Mall, West half of Grand Circus Park will cost Detroit, Mich. $1.828 per sq ft for 12,000 sq ft. The reinforced concrete slab, layed directly on the ground, supports the terrazzo surface which is divided into a 5 ft. hexagon pattern with metal dividers. This $21,940 contract to Michielutti Bros., Detroit, includes also reinforced concrete curbs and floor type drains. To complete the job, M. F. Wagnitz, city engineer, has allowed 45 calendar days.

(Continued on page 260)



architect: Black & West, Tulsa
tructural engineer: Lee Hendrix, Tulsa
contractor: Manhattan Construction Company
Muskogee, Oklahoma

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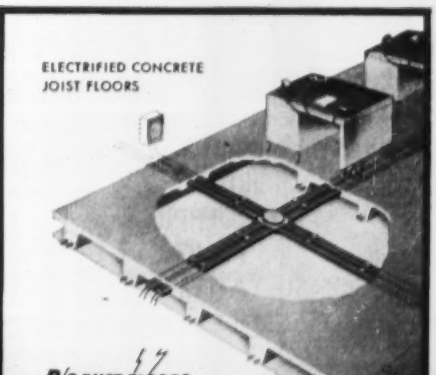

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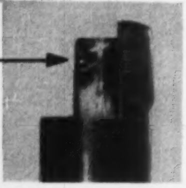

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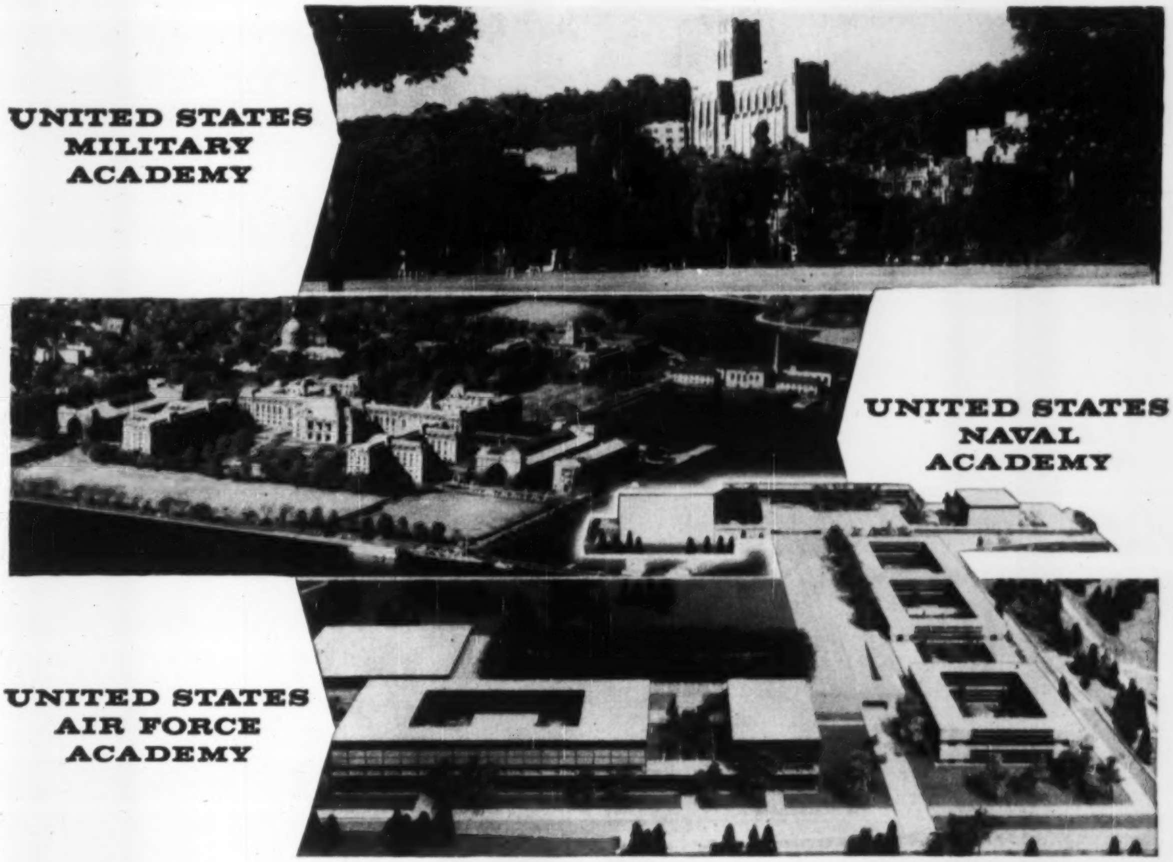
Highway Bid Price Trends — New York

Selected Unit Prices for 1948-56 Showing Weighted Averages of Contract Prices from Ten Districts, Department of Public Works, Division of Construction, State of New York.

Items	Unit	1948	1949	1950	1951	1952	1953	1954	1955	1956	'56 Range j
Applying water	Mgal	$2.61	$2.61	$1.77	$1.71	$1.73	$2.04	$2.16	$2.22	$2.79	$2.02– 3.83
Excavation uncl	cy	0.68	0.65	0.72	0.63	0.89	.....	.....	0.55	0.87	0.60– 1.12
with moisture control	cy	0.52	0.61	0.49	0.57	0.55	0.88	0.70	0.56		
trench, culv & bridge	cy	2.35	3.40	2.22	2.35	2.79	4.01	4.49	2.36	3.91	2.28– 4.27
Overhaul	sy	0.006	0.004	0.006	0.006	0.0038	0.0021	0.0057	0.0044	0.01	
Trimming road section	lfrd	0.32	0.37	0.37	0.29	0.41a	0.47a	0.51	0.44	0.59	0.44– 0.76
Preparing fine grade	sy	0.18	0.21	0.20	0.20	0.26	0.31	0.27	0.241	0.27	0.21– 0.31
Sewer pipe vit 4"	lf	0.65	0.61	0.94	0.98	1.19	1.50	1.53	1.16		
6"	lf	1.63	1.32	1.51	1.64	1.66	2.00	1.40	1.73	2.26	1.76– 3.00
8"	lf	1.69	1.77	1.70	2.45	1.87	2.50	1.39	2.00	3.23	3.00– 3.50
10"	f	2.46	1.93	2.91	3.46	.....	3.06	3.00	2.03	4.69	3.50– 6.00
12"	lf	3.28	2.53	2.91	3.45	5.25	3.26	2.37	2.72	5.17	4.50– 5.22
15"	lf	4.00	3.36	3.91	4.47	5.00	5.06	3.72	3.44	7.54	7.00– 8.00
18"	lf	4.89	5.26	5.04	5.55	7.00	.....	7.00	5.61	11.50	
24"	lf	6.15	7.54	7.89	9.47	13.00	15.00	7.00	7.44	16.36	11.00– 17.00
Underdrain VCP 4"	lf	0.78	1.01	0.85	1.25	0.77	0.98	0.99	0.60	1.00	
6"	lf	1.17	1.18	1.06	1.41	1.06	1.22	0.95	1.38		
C or V opt 4"	lf	0.89	1.14	0.73	1.07	1.14	0.88	1.01	0.96		
6"	lf	1.15	1.31	1.33	1.23	1.01	1.28	1.03	0.97		
Cor met pipe heavy 12"	lf	3.88	4.14	3.41	3.56	4.13	4.74	4.14	3.99	4.49	3.79– 5.39
15"	lf	5.13	4.56	3.73	3.96	5.00	5.95	5.26	4.56	5.41	5.00– 6.00
18"	lf	6.31	5.30	4.66	5.31	4.98	6.69	5.89	5.31	6.53	5.26– 7.00
24"	lf	8.31	7.68	7.75	8.63	8.33	10.04	8.20	7.01	9.99	7.80– 10.80
30"	lf	10.36	9.69	10.70	10.00	12.74	16.16	12.88	15.48	15.10	14.00– 17.00
36"	lf	12.61	11.55	13.50	15.00	15.95	17.84	15.00	17.58	19.05	14.30– 20.00
42"	lf	14.73	13.00	16.50	25.00	17.00	20.00	19.61	23.00	22.13	17.50– 25.00
Cast iron pipe 6"	lf	6.80	4.55	4.23	5.09	4.03	4.77	4.94	4.60	5.02	4.04– 6.78
8"	lf	4.67	4.95	5.06	6.89	5.55	5.78	5.40	6.11	6.19	4.00– 8.20
10"	lf	7.01	5.75	6.81	.....	6.19	7.00	8.32	5.30	8.25	5.71– 8.37
12"	lf	8.33	7.01	7.29	9.81	7.59	8.19	7.21	8.23	10.66	5.60– 12.03
16"	lf	12.11	8.48	6.48	12.45		8.95	9.69	11.00	12.62	8.10– 16.00
18"	lf	8.89	11.78	10.08	12.79	15.72	10.03	13.48	.....	10.00	
20"	lf	12.93	16.11	11.67	11.02	18.11	11.42	13.86	11.00	14.00	
24"	lf	15.11	16.09	11.85	22.64	28.31	22.30	14.82	.....	17.82	16.43– 25.00
36"	lf	16.00	26.00	24.84	28.00	.....	41.85	.....	36.91	43.47	40.00– 55.00
Reinf conc culv pipe 12"	lf	2.93	3.43	3.40	3.78	4.00	4.14	4.20	3.72	4.49	3.00– 5.45
15"	lf	3.91	3.99	3.32	4.54	4.30	4.42	5.28	3.97	4.86	3.85– 6.20
18"	lf	5.75	5.31	4.87	5.44	5.77	6.18	5.86	5.73	6.13	5.77– 8.00
21"	lf	5.44	6.70	5.90	6.35	7.87	7.60	8.21	6.34	8.36	7.80– 9.79
24"	lf	7.92	7.57	6.80	7.90	8.16	8.84	8.49	8.67	9.12	7.28– 11.15
30"	lf	11.12	10.56	9.48	11.42	12.27	12.32	12.08	11.57	13.22	12.00– 17.18
36"	lf	15.23	13.09	11.96	13.53	14.37	14.81	14.68	14.40	14.65	11.86– 22.18
42"	lf	16.91	18.76	14.62	16.60	18.41	18.93	18.22	20.62	17.86	15.51– 28.63
48"	lf	18.04	20.04	18.90	19.74	22.48	23.37	23.96	24.59	26.29	16.00– 34.33
54"	lf	27.68	29.09	19.02	24.44	26.21	27.89	26.74	28.54	25.68	21.44– 35.00
60"	lf	25.74	30.11	25.00	30.65	30.27	32.43	31.94	35.02	32.94	25.80– 40.67
72"	lf	40.00	44.65	40.00	41.28	42.45	48.27	41.55	41.74	45.69	41.16– 53.26
Reinf conc sewer pipe 12"	lf	2.58	2.79	2.97	3.87	4.16	3.76	3.64	4.24	4.50	3.97– 6.00
15"	lf	3.53	5.72	3.68	4.75	4.90	4.70	4.91	5.64	5.52	5.00– 6.19
18"	lf	4.02	4.55	4.28	5.44	5.83	5.96	5.25	5.89	6.30	5.29– 8.00
21"	lf	5.24	4.50	5.20	9.15	6.63	.....	.....	.....	9.79	8.00– 11.00
24"	lf	6.14	6.60	5.84	8.33	7.85	7.83	7.35	7.70	10.00	8.62– 12.00
30"	lf	9.86	9.36	7.41	10.00	.....	11.63	10.26	11.50	13.57	12.00– 15.00
36"	lf	9.04	11.92	10.80	11.25	14.30	13.29	13.54	11.70	16.61	16.00– 20.00
Portland cement:											
Type 2	bbl	3.64	3.76	3.58	3.90	4.20	4.34	4.34	4.24	4.69	4.43– 5.41
Type 2A	bbl	3.32	3.45	3.58	4.06	4.09	4.39	4.43	4.58	4.60	4.21– 5.31
Type 3	bbl	4.99	4.44	4.33	5.00	5.00	4.68	4.49			
Type 6, 6A	bbl	8.53	8.49	5.43	10.00	9.99	9.53	11.04	11.31	11.08	10.00– 15.00
Type N	bbl	4.05	4.21	3.89	4.26	4.40	4.37	4.90	4.97	5.25	4.61– 6.31
Conc for struct cl 1A	cy	39.85	41.73	39.32	46.26	52.87	57.92	49.06	48.10	56.45	50.20– 69.35
for railings	cy	108.47	133.31	88.67	94.53	125.64	137.91	135.77	100.00	133.00	125.00–150.00
Cl 1	cy	35.58	36.93	33.48	38.00	45.47	46.18	46.23	47.86	51.69	45.52– 65.52
Cl 2	cy	36.40	27.02	27.68	43.05	43.65	46.17	34.18	33.45	46.71	46.31– 60.00
Cl 3	cy	34.72	24.10	26.84	35.48	27.91	30.87	31.63	24.66	28.71	25.00– 60.00
Masonry, stone	cy	130.14	145.38	133.89	139.05	140.44	153.90	160.66	155.00	120.00	
Rub stone, ld with mortr	cy	42.17	50.09	46.03	48.31	48.09	59.36	65.60	50.44	50.75	50.00– 50.88
laid dry	cy	18.51	55.93f	22.05	30.61	41.72	50.97	35.96	40.00	56.00	
Metl reinf, conc pave	sy, p	0.56	0.57	0.52	0.66	0.66	0.76	0.86	0.81	0.85	0.69– 0.98
Steel fab reinf, 6x6 #6ga.	sy	0.51	0.55	0.54	0.67	0.69	0.74	0.71	0.75	0.88	0.60– 1.00
Bar reinf, conc pave	lb	0.11	0.12	0.11	0.141	0.152	0.141	0.162	0.123	0.16	0.12– 0.18
Opt. trans jt supports	lfjt	0.90	0.93	0.92	1.12b	2.41	1.69c	1.79	1.61	1.63	1.50– 1.83
Longit jt supports, opt	ea	0.20d	0.29d	.....	0.83	0.80	0.80	0.82	0.79	0.70	0.69– 0.93
Bar reinf for structures	lb	0.118	0.126	0.114	0.133	0.133	0.139	0.139	0.133	0.16	0.13– 0.17
Spiral bar reinf	lb	0.58	0.87	0.80	1.09	0.91	0.82	0.71	0.60	0.64	0.58– 0.78
Structural steel	lb	0.151	0.143	0.16	0.174	0.18	0.187	0.172	i	0.22	0.18– 0.26
Misc metals	lb	0.21	0.24	0.20	0.221	0.27	0.270	0.27	0.26	0.26	0.19– 0.51
Pile shoes, f&p	ea	8.36	8.23	8.61	6.67	8.22	15.00	.....	5.00	7.28	5.00– 10.89
Opt. guide railing	lf	1.98	2.15	1.99	2.28	2.48	2.82	2.98	2.44	2.70	2.50– 2.93
Opt. guide posts	ea	7.46	8.20	8.23	8.23	8.78	9.03	9.15	9.02	9.19	8.72– 9.85
Found crse ROB gravel	cy	1.60	1.64	1.33	1.33	1.69	1.87	2.44	1.78	1.96	1.65– 2.50
Screened gravel	cy	4.00	5.14	6.50	.....	.....	.....	.....	.....	7.00	
broken stone	cy	4.17	5.67	5.25	4.10	7.26	7.00	6.50	6.16	7.48	
Bott. crse broken stone	cy	7.25	6.07	6.40	7.22	7.27	7.12	6.77	6.16	8.00	6.40– 9.94
bit mac pen meth asph	cy	7.30	6.72	6.41	8.07	8.41	8.10	8.08	8.02	8.30	7.60– 11.96
Conc foundn for pave	cy	9.73	10.25	8.64	10.97	10.90	11.23	12.46	12.02	12.69	9.54– 15.23
Cement concrete pavement	cy	10.17	10.96	9.35	10.64	10.96	12.32	12.63	16.00	28.40	18.39– 35.00
with carbon black	cy	11.63	12.63	10.34e	12.92	12.32	12.92	14.76	14.15	14.77	13.33– 40.00
Cement concrete pavement	cy	14.44	14.10	13.73	12.95	12.94	16.70	17.10	12.47	12.69	11.38– 15.66
with carbon black	cy	15.08	15.40	10.00	14.11	13.25	15.00	16.82	13.97	14.57	
two-course	cy	10.85	12.89	9.79	10.78	13.00	11.00	11.72	12.01	15.24	12.00– 28.00
Asphalt concrete Type 2A	t	11.17	9.24	9.88	10.50	10.92	11.15	11.52	10.36	9.70	9.08– 12.59
Opt.	t	8.87	9.56	10.00	.....	10.04	10.82	10.06	10.50	13.00	
Top crse gr grav bit double surf treat	cy	2.03	3.18	2.36	3.28	3.63	5.45	5.26	6.24	8.00	
Bit mac type 1 pen method hot asph	cy	8.00	7.56	7.94	8.38	8.20	9.74	8.04	9.25	8.06	7.80– 8.47
Membrane waterproofing.	sy	2.90	2.60	1.85	2.53	2.09	1.89	1.73	2.10	2.72	2.56– 10.00
Prot crse for membr waterproofing	sy	4.13	3.98	2.96	2.92	3.25	2.46	4.03	4.00	4.53	3.07– 10.00
Bit mat, A paving	gal	0.183	0.18	0.162	0.171	0.181	0.184	0.184	0.180	0.19	0.17– 0.23
T road tar	gal	0.193	0.19	0.22	0.207	0.224	0.246	0.215	0.172	0.25	0.24– 0.28
T road tar	gal	0.195	0.20	0.20	0.208	0.23	0.257	0.244	0.217	0.25	0.24– 0.27

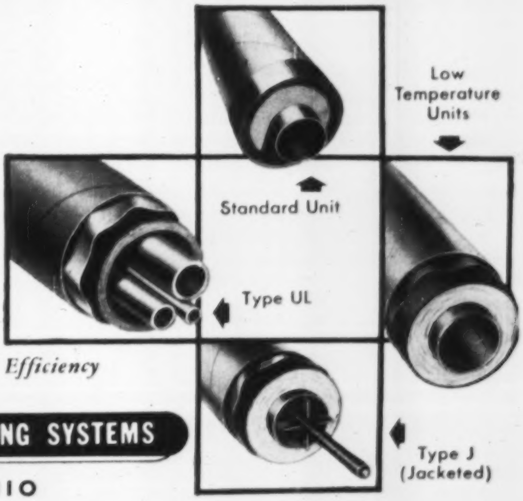
(Continued on page 263)


UNITED STATES MILITARY ACADEMY
UNITED STATES NAVAL ACADEMY
UNITED STATES AIR FORCE ACADEMY

Photographs courtesy United States Military Academy, United States Naval Academy, and United States Air Force Academy.

Ric-wiL underground piping systems serve ALL three...West Point, Annapolis and NOW...the new Air Force Academy

West Point and Annapolis have been serviced by Ric-wiL piping systems as far back as 1931. Since 1946 alone over 15,000 feet of Ric-wiL prefabricated piping has been purchased for the nation's top military colleges. Installation of Ric-wiL piping at the new 17,500 acre United States Air Force Academy has already been installed. Ric-wiL is indeed proud of the part they have played in serving these military academies for a period of over twenty-five years.


Low Temperature Units
Standard Unit
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Quality Piping Systems . . .
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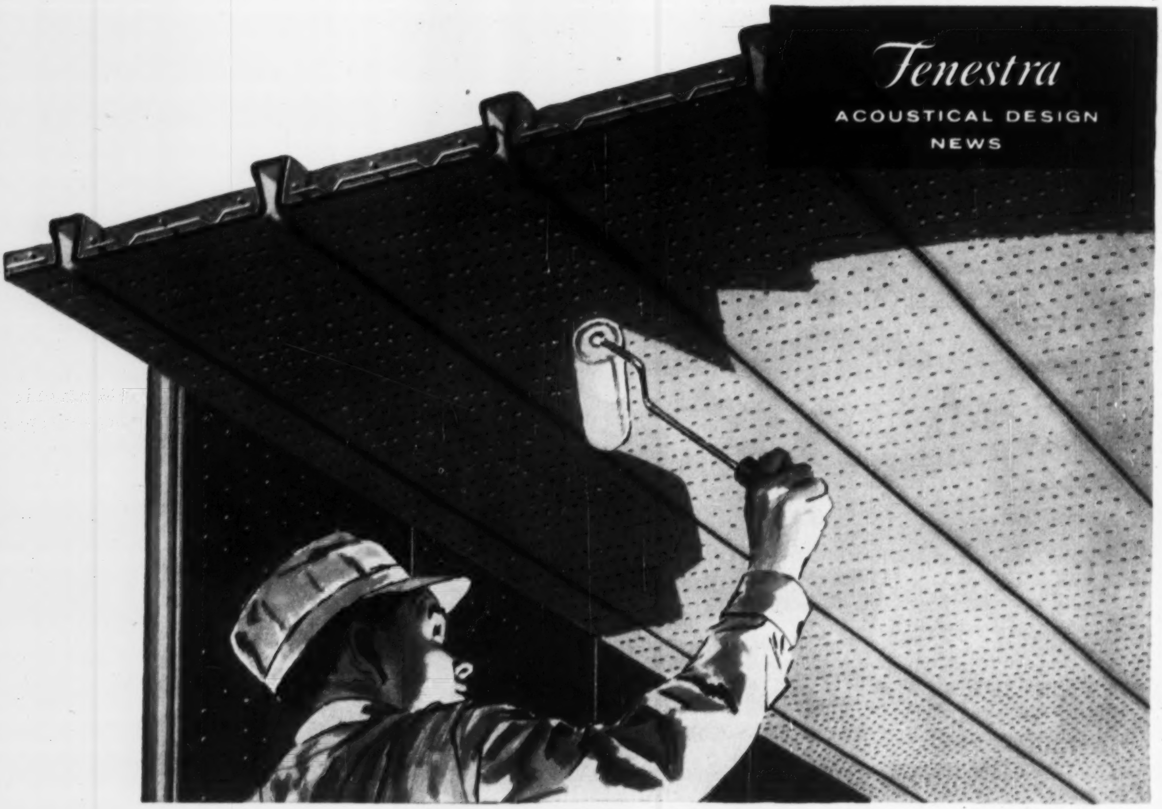

Fenestra Acoustical Holorib gives you a*

LOW-COST STRUCTURAL ROOF WITH "BUILT-IN" NOISE CONTROL!

The science of proper noise control has a place fully as important as heating, lighting and ventilation in modern buildings. Production noise cuts deeply into worker efficiency. It wears on the nerves, reduces output, causes accidents and increases labor turnover. It may also be the cause of expensive disability claims.

Fenestra Acoustical Holorib gives you an ideal, low-cost solution to industrial noise control. Combines finished acoustical ceilings, structural roof deck, and thermal insulation. It is quickly and easily erected. Total cost, installed, may be as little as 75 cents per square foot.

Made of 18-gauge steel—thicker than usual metal pan ceilings—Acoustical Holorib resists damage and is easy to maintain. The smooth perforated surface may be washed or painted as frequently as needed without reducing acoustical efficiency. There is no "stuck-on" material that may be damaged under production conditions. Flaking or "drop-offs" are eliminated.

If you are now planning a new industrial building or warehouse, you should get complete information on Fenestra Acoustical Holorib roofs. For your FREE copy of the 1957 *Fenestra Building Panel Catalog*, call your local Fenestra representative or write Fenestra Incorporated, Dept. ER-10, 2286 East Grand Blvd., Detroit 11, Mich.

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Your Single Source of Supply for
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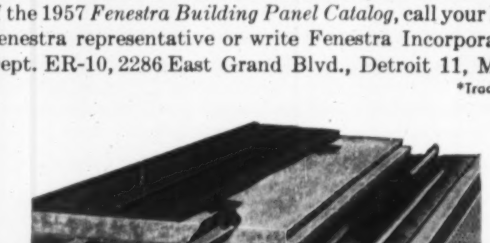

Fenestra
ACOUSTICAL HOLORIB ROOF

NRC — .80. Width, deck sections — 18". Heat Transmission Loss — 0.15 BTU (U factor) with 1" rigid insulation. Additional insulation may be added if required.

. . . Highway bid price trends—New York

(Continued from page 260)

Items	Unit	1948	1949	1950	1951	1952	1953	1954	1955	1956	'56 Range j
Stone filling	cy	3.52	3.79	3.72	4.77	7.34	7.77	5.37	2.74	4.81	3.78- 9.45
Dry stone paving, joints filled with sand	sy	4.14	4.35	4.46	4.55	5.37	5.83	6.32	6.43	6.45	4.25- 7.16
Riprap dry	cy	11.53	14.89	9.25	9.42	13.09	13.70	13.97	13.10	15.74	11.07- 17.66
grouted	cy	12.70	24.51	11.27	20.78	16.29	18.73	17.44	18.55	16.05	15.70- 18.00
Sheet piling timber	sf	0.81	1.08	0.54	0.94	0.88	1.24	0.71	1.11	0.98	0.92- 1.50
temporary	sf	0.42	0.50	0.26	0.32	0.40	0.64	0.70	0.45	0.58	0.10- 1.70
Timber piles, untreated	lf	1.66	1.63	1.47	1.52	2.03	2.32	1.69	1.37	1.80	1.33- 2.44
creosoted	lf	3.04	2.30	2.74	2.90	3.04	3.37	2.26	2.57	2.43	2.02- 4.17
Piles, steel bearing:											
10" HP @ 42#	lf	5.00	4.34	3.98	5.31	4.91	5.47	5.11	5.50	4.47	4.47- 5.25
12" HP @ 53#	lf	5.14	5.07	5.08	6.90	5.36	5.30	4.00	4.74	6.06	.....
conc, 12"x¼" shell cip	lf	4.15	5.35	4.65	.....	5.78	5.94	5.05	5.30k	5.63k	5.04- 8.75
Cleaning existing pave	mi	146.40	153.88	96.26	124.30	144.43	139.84	112.57	140.00	133.00	150.00-214.89
Cleaning existing pave	sy	0.066	0.13	0.19	0.09	0.058	0.12	0.091	0.067	0.05	0.03- 0.10
Screened gravel LM	cy	6.65	5.53	4.08	3.46	4.35	5.16	5.06	5.41	5.27	3.91- 8.00
Broken stone LM	cy	4.38	5.21	5.36	5.24	6.73	6.47	5.27	5.00	5.91	5.29- 7.41
Stone curb & headers	lf	5.44	4.41	4.75	5.75	4.96	5.10	4.97	6.00	5.05	3.99- 7.32
Resetting old curb	lf	2.42	2.75	3.47	2.53	2.40	3.23	2.02	2.89	2.62	2.59- 3.00
Conc curb Type C	lf	1.50	1.78	1.87	1.97	2.80	2.48	1.51	1.75l	1.99	1.33- 3.77
Reflecting conc curb, 9" W x9" to 12" deep		0.75	2.75	1.79	1.36	0.92	0.90	1.75	1.60	.....	.....
conc mall, 4'0" WxO—12½" deep	lf	3.07	3.57	3.33	3.50	3.50	5.00	3.50	4.00m	4.48	4.25- 5.00
Concrete gutters	sy	3.79	4.27	4.02	4.51	4.98	5.40	5.14	4.88	5.70	5.26- 7.29
Catch basins, MH & DI	cy	72.35	68.04	67.36	71.39	70.34	78.13	71.91	55.73	74.93	60.00- 99.84
Altering MH & CB	ea	28.38	44.58	48.05	43.00	48.00	44.07	49.44	52.56	48.21	33.30- 85.00
Concrete ROW markers	ea	5.76	6.19	5.00	7.42	8.85	9.24	9.45	10.12	10.00	9.00- 11.03
Concrete sidewalk, 6"	sy	3.57	3.94	3.66	4.85	4.74	4.79	4.70	5.25	5.50	4.56- 6.86
Timber & lumber	Mfbm	231.89	212.66	160.04	191.85	221.81	237.00	232.23	331.00	289.00	167.00-319.00
stress graded	Mfbm	253.95	235.85	217.64	500.00	301.89	400.00	357.24	389.00	440.00	400.00-450.00
creosoted	Mfbm	265.07	268.02	317.27	400.00	332.06	493.29	506.51	344.00	478.00	400.00-523.00
Relaying old pipe	lf	1.75	1.97	1.90	2.02	2.23	2.57	2.14	2.41	3.24	2.00- 4.38
Pneu projected conc	sf of f	1.53	1.59	1.13	1.47	1.73	0.93	1.50	1.32	2.28	1.50- 3.00
Emuls carbon black	lb	0.102	0.106	0.098	0.120	0.138	0.134	0.111	0.084	0.10	0.10- 0.50
Highway RR barricade	lf	10.85	6.63	8.86	6.29	8.18	8.14	8.22	8.67	9.32	7.62- 15.00
Top crse bit mac opt asph cutback road mix	t	4.71	4.43	3.50	4.33	4.10	5.53	4.50	4.40	6.00	.....
Bit mat A cutback	gal	0.189	0.18	0.16	0.165	0.185	0.191	0.17	0.17	0.20	.....
ROB gravel fill	cy	2.22	2.34	2.11	1.94	2.35	2.58	2.95	2.00	3.65	2.08- 4.87
Reflect hwy—RR xing signs	ea	87.50	171.25	205.00	112.50	147.50	202.50	180.56	200.00	225.00	175.00-250.00
Top soil, f&p	cy	1.90	2.37	2.86	3.38	3.73	4.16	3.29	2.71	2.91	1.50- 4.06
from stock piles	cy	1.25	1.10	0.98	0.85	1.02	1.12	1.14	0.95	1.07	0.78- 1.55
Seed & seeding f&p	acre	246.45	229.55	286.84	325.41g	297.51	325.42	319.92	276.50	297.00	264.00-477.00
plus ground prep, fert & mulch	acre	489.35	353.40	234.87	368.74	612.91	.....	.....	329.28	352.00	300.00-515.00
Sod & sodding	furn sy	1.37	1.50	1.27	1.18	1.27	1.45	1.55	1.45	1.32	1.12- 1.75
Mulch & mulching	furn acre	142.23	230.07	158.24	65.69h	152.16	200.00	.....	187.18	191.00	.....

*a Thruway $0.54–1952; $0.73–1953 *b Old standard, $2.41 new standard *c 4 new, lighter & cheaper types of trans jt supports allowed in 1953 *d Lin ft of joint *e Incl 1 contract of 39,100 cy @ $9.47 per cy *f Incl 6 contracts ranging in price from $50.00 to $90.00 per cy *g Incl 1 contract of 100 acres @ $295.00 per acre *h Incl 1 contract of 100 acres @ $55.00 per acre *i Mostly I-beams $0.148, mostly plate girders or trusses $0.195 *j Averages for individual Districts *k 3/16" shell *l Unmounted, grey cement, 6-10" W & 15-24" D *m 4' Wx1'1" D, top white cement, exc. cmt, reinf not incl

. . . Iowa State Highway Comm.—1948-57

			Weighted Averages of Contract Unit Prices									
Items	Unit	Quantity Aver Yr	1948	1949	1950	1951	1952	1953	1954	1955	1956	6 mo 1957
Grading	cy	29,365,443	$0.223	$0.206	$0.166	$0.205	$0.227	$0.192	$0.149	$0.158	$0.160	$0.151
Pave std conc.	sy	1,176,506	4.231	3.728	3.552	3.785	4.152	4.197	4.044	3.928	4.227	4.522
type A	sy	404,787	2.898	2.903	3.219	3.445	3.874	2.908	3.532	3.237	2.530	3.094
asphaltic cl A	t	444,760	7.054	6.977	6.093	8.281	8.098	7.919	7.131	7.027	6.834	6.057
Surfacing gravel	cy	533,121	1.168	1.341	1.365	1.382	1.569	1.497	1.516	1.307	1.487	1.726
crushed stone	cy	822,930	2.368	2.617	2.512	2.589	2.990	2.889	2.794	2.675	2.632	2.698
Concrete masonry	cy	87,638	43.350	43.643	39.834	45.696	48.059	47.909	41.235	43.891	47.910	44.999
Steel reinf.	lb	10,360,130	0.111	0.121	0.102	0.116	0.125	0.121	0.102	0.107	0.118	0.123
struct	lb	15,714,004	0.139	0.151	0.130	0.156	0.172	0.171	0.161	0.155	0.191	0.243
Piling untreated	lf	89,228	1.587	1.610	1.517	1.622	1.777	1.576	1.444	1.558	1.564	1.589
creosoted	lf	155,164	2.933	2.970	2.770	3.018	3.227	3.550	2.767	2.770	2.787	2.719
Exc cl 20 str.	cy	89,894	3.882	3.733	3.054	3.897	3.549	3.047	2.370	2.644	2.691	2.248
cl 21 str.	cy	17,131	16.070	17.277	14.490	17.764	21.996	18.411	16.447	16.361	16.929	18.685

. . . Missouri State Highway Comm.—1950-56

Items	Unit	Average Low Unit Bid Prices						
		1950	1951	1952	1953	1954	1955	1956
Clearing	ac	$130.63	$161.18	$215.82	$233.99	$198.36	$179.33	$175.07
	ac	95.72	124.39	179.76	130.00	117.94	139.93	115.92
Grubbing	ac	90.62	123.56	153.99	159.04	128.51	119.60	106.91
	ac	57.50	91.21	124.67	79.76	66.93	84.82	75.11
Excavation cl A	cy	0.31	0.37	0.47	0.42	0.28	0.33	0.35
cl A	cy	0.33	0.43	0.54	0.45	0.35	0.40	0.36
cl C	cy	1.06	1.22	0.95	1.26	1.19	0.90	1.15
cl C	cy	1.48	1.84	2.06	1.58	1.25	1.52	1.42
Machine grading cl 1	sta	20.94	26.47	36.44	27.65	25.29	29.84	27.35
cl 2	sta	29.09	37.18	47.79	36.85	34.50	39.78	34.50
Excavation, struct	cy	2.66	3.44	4.26	3.50	2.97	3.02	3.36
Compaction in cuts	cy	0.08	0.08	0.18	0.06	0.08	0.03	0.06
Water	100 gal	0.45	0.46		0.50		0.50	0.46
Aggr roll stone base	t	2.36	2.89	2.41	1.85	2.09	1.90	2.34
spread, shape, compact	sy	0.32	0.44	0.54	0.41	0.42	0.45	0.39
stabilized	t	2.20	2.36	2.54	2.63	1.62	1.67	1.95
spread, shape, compact	sy	0.33	0.62	0.56	0.47	0.32	0.33	0.33

(Continued on page 264)

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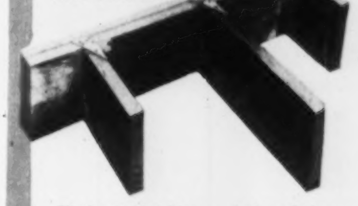

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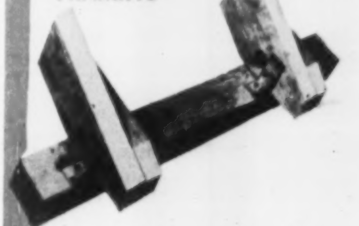

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. . . Highway bid price trends–Missouri

(Continued from page 263)

Items	Unit	Average Low Unit Bid Prices 1950	1951	1952	1953	1954	1955	1956
Granular base material	t	2.21	1.56	2.21	2.80	1.64	1.81	1.79
spread, shape, compact	sy	0.30	0.41	0.76	0.31	0.35	0.21	0.28
Primer	gal	0.17	0.24	0.21	0.16	0.20	0.15	0.20
sanding	t	......	......	......	4.60	4.39	4.76	5.36
Asphaltic concrete, type B	t	5.92	7.85	7.98	7.97	6.23	5.98	6.30
type C	t	6.45	7.82	8.21	8.44	6.75	6.60	6.85
Asphaltic wedge course	t	6.87	8.27	8.48	8.67	6.75	6.42	6.62
Bit matl haul & windrow	cy	2.37	2.82	3.80	3.61	2.45	3.85	3.22
surf, process	mi	791.72	721.50	1,098.66	1,301.13	826.04	1,102.50	1,120.62
primer (MC-O)	gal	0.19	0.23	......	0.26	0.28	0.17	0.14
binder	gal	0.11	0.13	0.12	0.14	0.10	0.11	0.14
seal coat	gal	......	......	0.13	......	......	0.16	0.21
Cover matl, seal coat	t	......	......	5.00	......	......	4.14	3.73
Bit matl, dble seal coat	gal	0.16	0.18	0.16	0.13	0.13	0.18	0.30
	t	5.00	5.14	4.50	4.88	3.67	3.78	5.96
Granular surfacing	cy	2.07	2.59	2.85	2.26	2.09	2.11	1.98
Pavement PCC 8"	sy	3.69	3.85	4.42	4.06	3.89	4.14	4.53
Appr slabs, bridges	sy	......	......	......	7.00	13.68	14.16	14.54
Concr cl B box culv	cy	48.18	55.50	66.78	64.20	55.85	62.94	54.03
other than boxes	cy	79.96	92.05	113.34	111.16	103.10	74.75	115.47
Culvert CMP 15"	lf	2.50	2.93	3.10	3.01	2.77	3.08	2.93
24"	lf	4.55	5.02	5.17	4.95	4.72	5.18	5.22
36"	lf	8.49	9.38	10.35	9.33	9.18	9.55	9.54
48"	lf	11.20	12.99	14.21	12.86	12.91	13.64	13.73
RCP 15"	lf	2.90	3.28	4.47	3.55	3.54	3.86	4.27
24"	lf	5.15	5.78	5.81	6.00	5.54	6.44	6.39
36"	lf	10.05	10.95	12.61	10.13	9.10	10.98	11.11
48"	lf	14.00	17.35	16.44	16.00	15.32	19.61	15.21
metal arch type B1	lf	2.69	3.50	4.90	3.54	3.13	3.19	3.10
B3	lf	4.60	5.29	5.69	5.12	5.10	5.54	5.60
B5	lf	8.89	10.06	10.44	9.82	9.80	10.64	10.60
B8	lf	16.11	18.31	20.23	18.69	18.58	19.22	19.08
relaid pipe	lf	2.04	2.85	3.56	3.22	2.23	2.86	2.72
Steel reinf	lb	0.11	0.13	0.15	0.15	0.13	0.14	0.14
Guard rail	lf	2.55	2.62	2.56	2.74	2.57	3.68	3.33
Fertilize & mulch	ac	167.72	190.96	225.92	218.03	191.22	199.10	197.39
Sodding	sy	0.49	0.54	0.67	0.63	0.67	0.55	0.60
Bridge & Structure								
Excavation, struct cl 1	cy	6.12	6.87	10.37	11.71	6.55	7.44	7.62
cl 2	cy	15.33	20.24	27.21	22.27	20.55	22.71	20.37
cl 3	cy	2.55	3.85	5.37	3.77	2.78	3.21	3.20
Concrete cl B	cy	47.23	54.23	65.49	61.05	51.15	54.30	54.04
substructure	cy	55.30	65.15	66.07	68.47	64.67	59.10	64.25
superstructure	cy	57.46	66.25	76.23	68.62	62.85	65.19	82.82
hand rail	cy	117.77	122.29	130.81	119.32	115.99	102.13	137.31
Steel fab struct I beams	lb	0.13	0.16	0.15	0.16	0.15	0.16	0.18
truss spans	lb	0.22	0.24	0.21	0.24	0.18	0.26	0.25
bearing plates	lb	0.75	0.89	0.91	0.78	0.76	0.69	0.77
Gray iron alloy castings	lb	0.73	0.97	0.79	0.95	0.85	0.90	0.96
Steel reinf	lb	0.11	0.13	0.14	0.15	0.13	0.14	0.15
Piles treated timber	lf	3.12	3.70	4.34	3.75	3.77	3.90	3.73
concrete	lf	6.96	6.09	11.32	8.68	7.61	6.95	8.47
steel	lf	5.29	7.03	8.59	6.31	5.94	5.59	6.97

. . . South Carolina Highway Dept.—1952-57

Averages—by years Items	Unit	Yearly average unit prices 1956–1957	1955–1956	1954–1955	1953–1954	1952–1953
Bridge						
Beams, prest conc 50′	ea	$1,005.80	......	......	......	......
53′	ea	1,242.00	......	......	......	......
60′	ea	1,368.00	......	......	......	......
65′	ea	1,510.00	......	......	......	......
70′	ea	1,600.00	......	......	......	......
74′	ea	2,100.00	......	......	......	......
76′	ea	2,070.00	......	......	......	......
82′	ea	2,200.00	......	......	......	......
Cement conc cl A	cy	65.72	$54.61	$62.61	$63.17	$66.47
cl AA	cy	60.00	......	......	......	......
cl A, culv	cy	85.00	......	......	......	......
cl A, bridges	cy	100.00	......	......	......	......
Cut-off mall, untr timber	lf	6.33	5.66	6.00	6.12	6.25
Excavation, dry	cy	8.21	7.09	9.62	11.75	11.23
wet	cy	25.22	9.21	23.20	21.75	23.25
wet & dry	cy	5.18	3.32	4.60	8.06	4.66
rock	cy	27.49	12.31	20.80	21.66	31.00
unclas	cy	2.03	......	......	......	......
Guardrail, metal 10 ga	lf	......	2.10	3.00	......	2.75
Handrail, fabr metal	lf	11.50	11.43	4.00	......	......
aluminum	lf	8.41	9.00	......	......	......
pipe	lf	3.08	3.27	2.95	3.33	3.16
Hardware	lb	......	0.31	0.31	0.325	0.41
Piling, timber creos	lf	3.33	3.16	2.99	3.15	3.36
untr	lf	2.00	......	......	......	......
octag index, 24"	lf	......	22.00	......	......	......
octag conc pre-cast incl stl reinf 21"	lf	14.66	11.00	8.31	......	......
octag prest, 21"	lf	13.75	11.35	......	......	......
24"	lf	......	11.00	......	......	......
pre-cast sht, 5"x12"	lf	7.00	3.25	4.00	......	......
incl stl reinf 16"	lf	7.83	8.00	8.50	8.45	13.15
18"	lf	12.00	10.00	8.90	9.05	11.00
prestressed, 14"	lf	10.46	6.00	......	......	......
16"	lf	14.50	......	......	......	......
18"	lf	19.75	......	......	......	......
stl bearing 10" at 42#	lf	6.81	4.95	5.44	6.31	6.68
12" at 53#	lf	......	6.00	8.50	8.00	......

(Continued on page 266)

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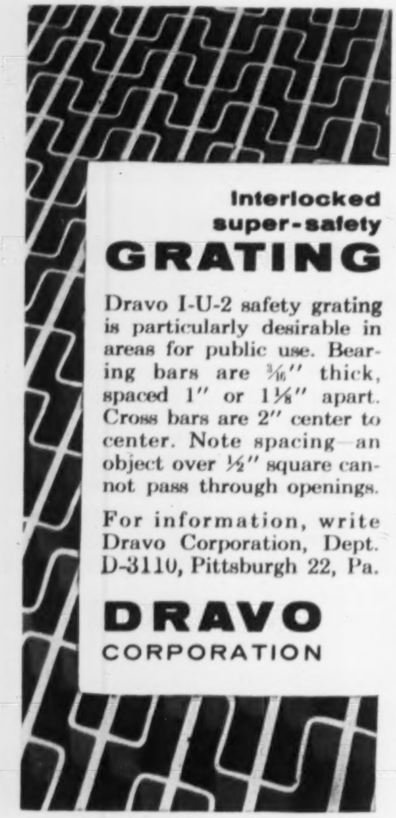
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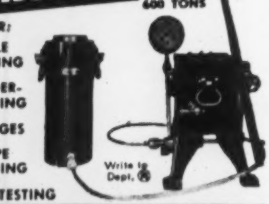

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. . . Highway bid price trends—South Carolina

(Continued from page 264)

Averages—by years Items	Unit	Yearly average unit prices 1956–1957	1955–1956	1954–1955	1953–1954	1952–1953
Riprap	t	8.45	7.37	7.45	8.50	9.33
Slope drains, conc block	lf	2.30	2.40	......	......	......
pre-cast conc tile	lf	3.00	2.08	2.32	2.54	2.94
Steel, reinf, struct	lb	0.133	0.115	0.112	0.1186	0.129
struct, incl paint	lb	......	0.16	0.238	0.25	0.17
sway braces, incl pnt	lf	0.283	0.24	0.241	0.248	0.26
Timber, struct, creos	Mbf	......	385.00	333.88	355.00	363.00
treated	Mbf	400.00	305.00	215.00	......	......
Waterproofing, 2nd meth wilhout protect course	sy	......	5.00	4.33	6.25	13.00

Road

Averages—by years Items	Unit	1956–1957	1955–1956	1954–1955	1953–1954	1952–1953
Asphalt for prime	gal	0.184	0.145	......	......	......
Base course, earth, type						
ground surf matl	cy	0.59	0.534	0.555	0.60	0.66
pit matl	cy	0.40	0.384	0.351	0.38	0.42
macadam, with prime, unif 8″	sy	1.40	1.30	1.23	1.20	1.37
10″	sy	1.08	1.10	1.55	1.28	......
12″	sy	1.28	......	......	......	......
cmt conc, unif, 7″	sy	......	3.50	......	......	......
stabil aggr 300#/sy	sy	2.35	......	......	......	......
with prime, unif 8″	sy	......	1.45	1.29	......	......
10″	sy	1.09	1.36	1.28	1.40	......
with 12% PC, unif 12″	sy	......	4.00	......	......	......
earth asph	t	3.30	......	......	......	......
unif 4″	sy	0.87	0.92	0.645	0.77	0.73
6″	sy	1.05	......	......	......	......
9″	sy	1.34	......	......	......	......
hot pl mix, unif 4″	t	5.50	4.70	......	......	......
asph 200#/sy	t	5.00	......	......	......	......
Bit surf, double treat	sy	0.34	0.318	0.310	0.325	0.337
single treat	sy	0.21	0.170	0.241	0.23	......
with prime, tp 1	sy	0.225	0.329	......	......	......
Binder course, asph conc						
tp 1 or 2	t	5.65	5.55	6.06	8.05	7.00
tp 1 80#/sy	t	7.95	......	......	......	......
Brick masonry	cy	67.50	50.00	75.00	60.00	70.00
Catch basins, tp 1	ea	191.55	169.36	188.39	183.68	208.42
tp 1, adj	ea	200.00	50.00	130.00	......	......
tp 1 using salv cast	ea	150.00	......	......	......	......
tp 2	ea	284.16	261.66	283.19	165.71	275.00
tp 3	ea	288.00	260.00	258.04	242.50	256.50
tp 4	ea	310.00	277.00	275.66	243.33	262.50
tp 5	ea	267.07	259.14	226.21	235.34	220.00
tp 5, use salv cast	ea	......	225.00	......	......	......
tp 6	ea	291.50	273.33	278.00	239.50	260.00
tp 7	ea	290.55	256.38	264.89	262.15	237.18
tp 7, use salv cast	ea	......	225.00	......	......	......
tp 9	ea	125.11	99.37	136.25	......	......
tp 12	ea	......	250.00	......	......	......
tp 13	ea	......	250.00	......	......	......
tp 15	ea	......	250.00	......	......	......
tp 17	ea	......	250.00	......	......	......
adjusting	ea	27.50	100.00	50.00	55.00	20.00
use salv cast	ea	260.00	162.50	175.00	162.50	......
Cement rubble masonry	cy	40.00	36.83	......	......	40.00
for walls	cy	......	35.00	40.50	36.50	70.00
Clear & grub pits	ac	75.95	57.55	47.42	47.21	76.25
Conc block mas, walls & coping	cy	......	30.00	......	......	......
Conc curb, 6″x15″	lf	2.00	......	......	......	......
6″x18″	lf	......	3.00	1.58	......	......
7″x12″	lf	1.40	......	......	......	......
7″x15″	lf	1.95	......	......	......	......
7½″x9″	lf	......	0.77	......	......	......
8″x7″	lf	1.50	......	......	......	......
9″x15″	lf	1.91	2.06	......	1.37	......
10″x10″	lf	1.00	......	......	......	......
9″x15″, white cmt	lf	......	1.94	1.70	......	......
& gutter, 2′-6″	lf	2.00	......	......	......	......
3′-0″	lf	2.08	2.12	1.95	2.01	2.30
Conc driveway, unif 6″	sy	4.70	4.30	4.51	4.34	4.21
6″ to 6¾″	sy	......	5.00	......	......	......
Conc gutter, bottom 18″	lf	3.25	2.87	2.85	2.70	......
24″	lf	3.35	2.93	3.12	2.77	......
Conc median, white cement	sy	6.27	6.58	6.15	......	......
Conc sidewalks, unif 4″	sy	3.25	2.82	2.98	2.85	3.02
Conc, structures, cl A	cy	61.35	56.91	66.88	78.77	62.22
cl B	cy	71.66	42.50		75.00	85.57
steps, cl B	cy	80.00	80.00	76.00	79.16	60.00
Curb, reset stone	lf	......	1.00	......	......	......
Cut off walls untr struct timber	lf	5.76	5.00	5.75	6.25	6.00
Drop inlets, 24″x24″	ea	169.00	145.00	128.75	......	200.00
24″x24″ salv cast	ea	156.00	......	......	......	......
24″x36″	ea	167.39	153.13	151.50	158.04	179.19
adjusted	ea	32.50	37.50	41.66	40.00	45.00
rebuilt, salv cast	ea	121.66	112.50	113.00	108.33	......
Excavation, common	cy	......	0.333	0.373	0.383	0.43
unclass	cy	0.40	0.357	0.364	0.406	0.46
unstable matl	cy	......	0.48	......	......	......
Fertilizer, 5-10-5	t	52.10	......	......	......	......
Filter blanket	t	......	9.55	......	......	......
Junction box, 24″x24″	ea	152.41	146.87	......	......	......
24″x30″	ea	75.00	150.00	......	......	......
24″x36″	ea	200.00	......	......	......	......
30″x60″	ea	......	200.00	......	......	......
4′x4′		250.00	......	......	......	......
Manholes	ea	174.36	160.71	168.76	176.31	216.70
adjusting	ea	53.07	36.78	25.19	37.14	62.50
rebuilt, salv cast	ea	......	125.00	......	145.00	175.00
Markers, right-of-way	ea	......	5.00	......	......	......
Nitrate of soda	t	$71.50	......	......	......	......
Overhaul	cyhm	0.042	$0.035	$0.041	$0.045	$0.054
Pipe, BCCM, tp B, 15″	lf	......	3.30	......	......	......
48″, 8 ga	lf	......	19.00	......	......	......
48″, elong	lf	......	20.00	......	......	......
60″	lf	30.00	24.00	......	......	......
36″, 10 ga	lf	......	12.00	......	......	......
39″	lf	17.00	......	......	......	......
24″, 12 ga	lf	......	6.40	......	......	......

(Continued on page 268)

YOLOY "E" IS ON THE JOB

Gives increased pay load, strength and durability to Standard Steel's gasoline trailers

When Standard Steel Works of North Kansas City, Mo., built this modern 7000-gallon, 3-compartment conical gasoline transport, they wisely chose Youngstown's Yoloy "E" high strength-low alloy steel. It's a tough, shock- and wear-resistant steel that allows designers to increase structural strength, reduce dead weight—increase payload capacity. Furthermore, Yoloy's excellent corrosion-resistance gives longer life to these Standard Steel trailers.

Youngstown Yoloy Steels are available in sheets, plates, strip, shapes, hot rolled and cold finished bars as well as seamless and continuous weld tubular products.

Call your nearest Youngstown District Sales Office today for full information and service engineering on the proper Yoloy Steels for your particular requirements.

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Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

QUALITY YOUNGSTOWN SERVICE

Write for these free technical pamphlets covering the Yoloy Family of Steels:

YOLOY "E"	**High Strength Low Alloy Steel-standard applications**
YOLOY	**High Strength Low Alloy Steel-special applications**
YOLOY "S"	**Higher Strength Steel for increased service life**
YOLOY "C"	**Corrosion Resistant Grade for deep forming**
YOLOY PIPE	**Continuous Weld for corrosion resistant applications**

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General Office
and Shops
PHOENIXVILLE, PA.

Subsidiary—Barium Steel Corporation

. . . Highway bid price trends–South Carolina

(Continued from page 266)

Averages—by years Items	Unit	Yearly average unit prices 1956–1957	1955–1956	1954–1955	1953–1954	1952–1953
Pipe (Cont'd.)						
18", 14 ga	lf	5.00				
24"	lf	6.25	5.40			
30"	lf		6.00			
CIP, 2"	lf	2.00				
galvanized, 2"	lf		0.80			
galv iron, 3"	lf	2.50				
culv, RC, 12"	lf	2.62	2.40			
15"	lf	2.70	2.35	2.29	2.34	2.30
18"	lf	3.56	3.21	3.16	3.18	3.12
24"	lf	5.67	5.13	5.06	5.18	5.14
24", ES	lf	6.57	4.98	5.72		
30"	lf	8.03	7.26	7.30	7.34	7.48
30", ES	lf	8.46	7.81	7.90	7.00	
36"	lf	10.34	9.19	8.82	9.38	9.76
36", ES	lf	10.50	9.75	9.50		
42"	lf	13.16	11.60	11.22	11.56	11.97
42", ES	lf	13.87	13.59	13.20	10.00	
48"	lf	14.63	13.59	13.10	13.60	44.01
48", ES	lf	15.37	16.16	17.00		
54"	lf	17.50	15.03	15.37	14.75	17.37
54", ES	lf		16.00	17.00		
60"	lf	23.11	20.43	19.81	19.73	22.87
60" ES	lf	22.00	25.75			
66"	lf	30.00				
72"	lf	29.79	32.16	30.20	33.33	38.20
84"	lf	45.91	44.93	43.52	45.67	42.75
relaid, 12"	lf	1.33	1.50	1.03	1.12	1.59
15"	lf	1.59	1.35	1.31	1.52	1.64
18"	lf	2.04	1.79	1.66	1.98	2.18
24"	lf	2.98	2.31	2.51	2.78	3.10
30"	lf	4.26	3.64	3.33	3.79	4.04
36"	lf	5.30	3.85	4.20	4.08	4.97
42"	lf	7.50	5.72	3.50	6.12	6.00
48"	lf	7.50	5.00	5.00	6.00	7.50
60"	lf	15.00				
struct plate, 5 ga, 96"	lf	60.00				
114"	lf	72.00				
7 ga, 72"	lf	43.00				
84"	lf		40.75			
8 ga, 72"	lf		34.50			
120"	lf	71.16	71.66	64.83	66.25	67.25
132"	lf	78.87	71.95	66.50	75.00	76.66
144"	lf	85.00	78.00			
10 ga, 60"	lf		27.00			
96"	lf	52.00	49.50	48.00	50.48	47.37
102"	lf	60.00	44.00			
108"	lf	57.90	55.07	54.50	56.12	54.10
120"	lf	62.00	57.33			
132"	lf	75.00				
36"	lf		16.00			
vitrified clay, 4"	lf		3.50			
Rem & dispose, exist pave	sy	0.62	0.55	0.56	0.56	1.20
Resurf, hot laid asph conc surf crse, tp 2	t	5.46	5.29	4.90	5.11	
for patch, tp 2	t	5.08	4.67	4.57	4.68	4.40
hot pl mix sand asph	t	4.00	4.03	3.66	3.58	3.41
patch	t	3.63	3.40	3.40	3.15	3.20
hot laid asph conc binder crse, tp 2	t	5.10	4.86	5.19		5.53
patch, tp 1, 2	t	4.60	4.48	4.77		
Riprap, protect slopes	cy	9.71	9.64	9.52	8.78	10.63
	t	7.50	6.10	6.50	9.54	10.29
Scarify, mix, etc	Msy	45.70	41.40	38.01	39.49	41.30
Seed slopes & shoulders	Msy	59.00				
Select matl, shoulders	cy	0.54	0.54	0.586	0.579	0.648
& slopes	cy	0.70				
Steel, reinf, struct	lb	0.138	0.137	0.156	0.178	0.181
Surf asph conc surf crse, tp 1	t	6.13	6.27	6.85	6.80	
tp 2	t	6.97	7.00			
Terracing	lf	0.06	0.05	0.125	0.03	0.052
Timber, untr struct	Mbf	225.00				
Underdrain, pipe, 4"	lf	1.01	0.86	1.01	1.17	1.52
6"	lf	1.50				

. . . Kansas State Highway Comm.—1954-57

Item	Unit	Average Unit Prices 1954	1955	1956	1st Half 1957
Cement	bbl	$3.86	$5.00		$5.75
Checks, wash	lf	2.51	2.84	$2.88	2.76
Conc, cl A					
bridge slab & beam	cy	50.48	51.10	50.26	52.29
RCB	cy	34.29	39.27	38.19	36.70
culvert & misc	cy	38.19	42.83	42.59	43.98
cl AAA bridge	cy	53.69	56.21	52.94	53.88
Culverts, reset pipe	lf	2.07	2.13	2.66	2.19
Curb, protection	lf	0.87	1.65	2.08	2.19
edge 1½"	lf	0.57	0.52	0.55	0.43
edge 4"	lf	0.59	0.68	0.76	0.65
edge 6"	lf	0.54	0.57	0.62	0.55
edge 8½"	lf	0.90	0.85	0.86	0.75
Curb & gutters, gutter	lf	2.13	2.48	2.73	2.19
combined type I	lf	2.28	2.36	2.35	2.20
II	lf	2.15	2.39	2.38	2.06
Devices, bearing	lb	0.39	0.52	0.53	0.58
erection	lb	0.04	0.20		
Ditch lining, grtd stone	sy	3.22	5.15	4.26	3.90
concrete	sy	4.89	5.09	4.63	7.09
Drains, pipe under-drains 6"	lf	3.86	4.25	4.19	5.31
6" outlet	lf	3.78	4.13	4.21	5.48
slope, concrete	lf	3.50	3.94	3.78	4.12

Item	Unit	Average Unit Prices 1954	1955	1956	1st Half 1957
Embankment, compact					
earthwork, type A	cy	0.044	0.043	0.048	0.050
B	cy	0.027	0.032	0.029	0.028
AA	cy	0.045	0.051	0.046	0.046
AAA	cy		0.100		
C	cy	0.048			
Exc, bridge, cl I	cy	5.63	5.25	4.88	5.28
II	cy	19.03	17.51	16.91	17.11
III RCB's	cy		2.76	1.77	1.77
III other	cy		6.21	6.18	6.37
III misc	cy	3.77	4.25	3.64	3.34
sewer, rock	cy	11.07	10.65	9.64	8.65
common	cy	3.05	3.02	2.97	3.25
roadway, rock	cy	0.700	0.701	0.568	0.780
common	cy	0.201	0.245	0.231	0.243
unclassified	cy	0.228	0.257	0.400	
common, sec	cy	0.204	0.189	0.224	0.200
rock, sec	cy	0.680	1.300	1.180	
linear grading	sta	36.38	55.56		
compact	sta	40.07	50.16	46.03	42.10
Fence, remove stone	lf	0.31	0.23	0.44	0.46
steel plate guard	lf	3.27	3.21	3.28	3.07
cable guard, spec	lf	4.25	3.20	3.00	1.84
rem & reconst guard	lf	1.72	1.52	1.89	1.35
rem steel plate guard	lf	0.50	0.44	0.56	

(Continued on page 275)

these sturdy BAY CITY
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Building bridges is BIG business along the Erie section of the New York State Thruway. It takes good cranes to do the job . . . on time! This view near Westfield, New York, shows two BAY CITY CraneMobiles, with 80 foot boom and one yard bucket, pouring concrete for a bridge over Chautauqua Creek. BAY CITY cranes were employed for all erection, concrete placement and handling of materials throughout the job. Johnson, Drake and Piper, Inc., of New York City, the contractors for this work, are operating nine BAY CITY cranes on various projects in and around Buffalo.

If you have a construction or lifting job to be done . . . you, too, can depend on the CraneMobile. With a range of capacities up to 35 tons, and a selection of carriers to fit *any* task . . . CraneMobiles have the capacity, speed and mobility to make all lifts easier. Write today for catalog . . . or see your nearest BAY CITY dealer for details on the CraneMobile and/or crawler excavators, ½ to 1½ yard capacity.

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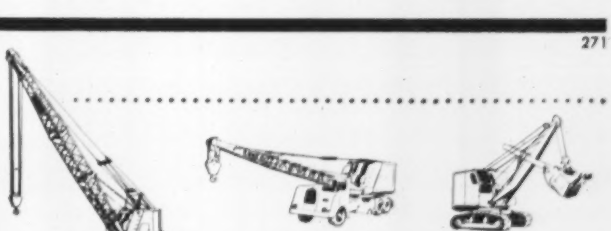

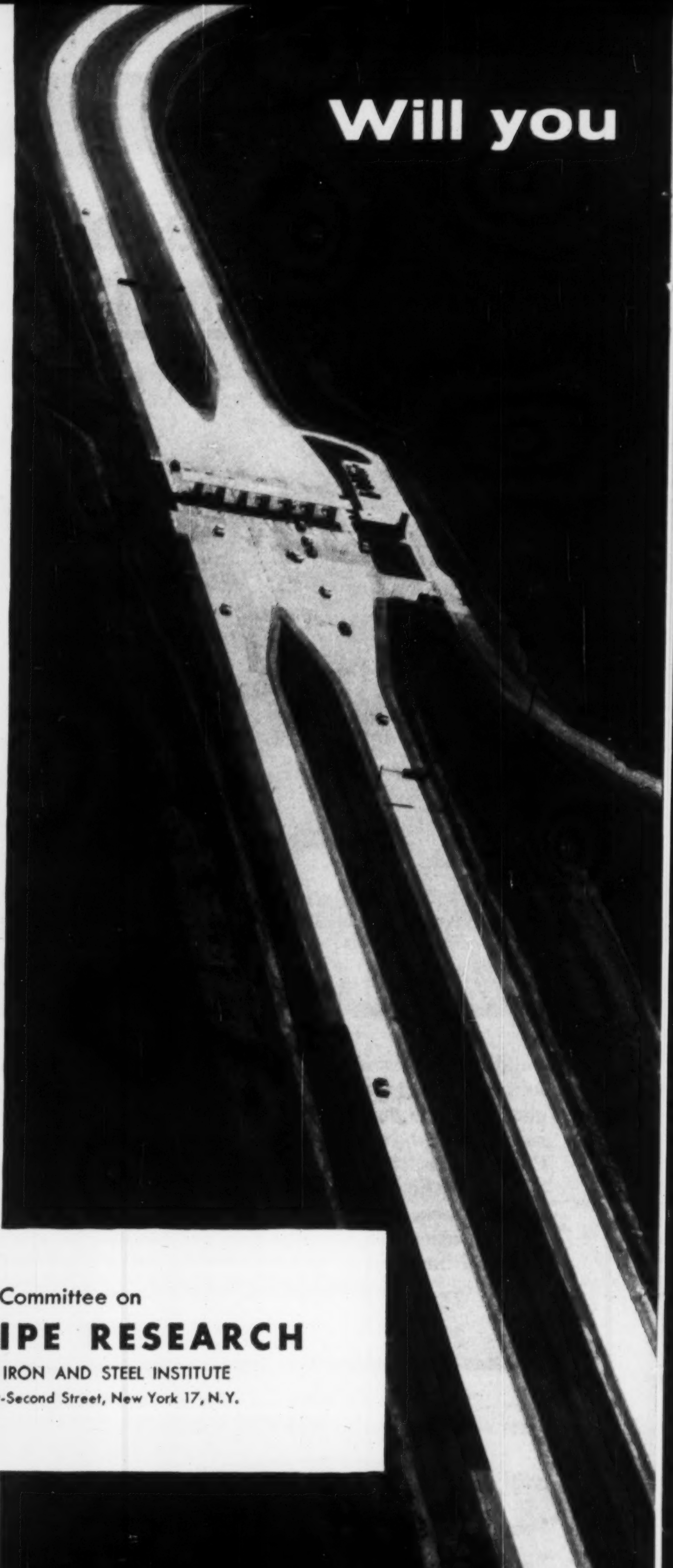

Indiana Turnpike
sets the pace

The Indiana Toll Road scored a "first" with steel pipe snow melting systems at all of its Toll Plaza areas. This innovation in highway construction will, in the opinion of informed engineers, add immeasurably to the safety factors in bad weather and increase the traffic handling capacities at these vital points of entrance and egress.

In the national highway program, full consideration should be given to the advantages of steel pipe snow melting and ice removal systems for interchanges, bridge floors, elevated ramp sections, over-passes and other road sections where conventional control methods are no longer adequate.

Only Steel Pipe gives *all* these advantages:

- **Low cost with durability**
- **Strength unexcelled for safety**
- **Formable—bends readily**
- **Weldable—easily, strongly**
- **Threads smoothly, cleanly**
- **Sound joints, welded or coupled**
- **Grades, finishes for all purposes**
- **Available everywhere from stock**

Steel Pipe
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Committee on
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AMERICAN IRON AND STEEL INSTITUTE
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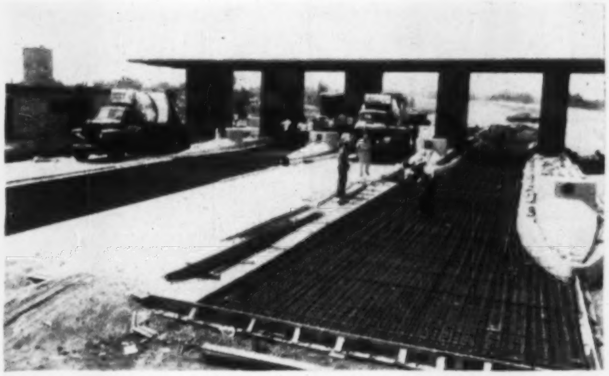
need automatic snow and ice removal on your next big job?



Steel Pipe snow melting grids in process of installation on toll plaza and plaza approaches of Indiana Turnpike.

Indiana Turnpike Toll Plaza after a heavy snow shows effectiveness of automatic Steel Pipe snow melting.

Whether for a great new highway, bridge, skyscraper or airport, a steel pipe snow and ice removal system may be indicated . . . if the project is to meet not only the demands of today but, more importantly, those of tomorrow.

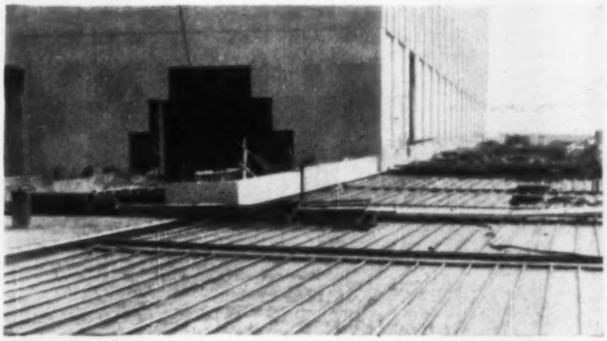
More and more consulting and construction engineers realize that an initial expenditure for steel pipe snow and ice removal installations may be repaid in a relatively short time by elimination of costly manual or mechanical removal methods, decreased maintenance and labor costs, and greater safety, mobility and convenience.

Steel pipe . . . the most widely used pipe in the world for snow melting, radiant heating, fire sprinkler systems, electrical raceways, steam, air and fuel piping . . . is just right for the heat transmission lines and grids of such modern snow melting systems.

Send for this FREE booklet

A free 48-page booklet, "Steel Pipe Snow Melting and Ice Removal Systems" containing valuable engineering data, is yours for the asking. Write for it today.

SNOW MELTING SYSTEMS



Steel Pipe sidewalk snow melting systems, like this one at Chicago's Prudential Building, are an economic "must."

With the jet aircraft age upon us, Steel Pipe snow melting for airport runways and aprons will solve many problems.

. . . Highway bid price trends–Kansas

(Continued from page 268)

Item	Unit	Average Unit Prices 1954	1955	1956	1st Half 1957
Hedge, grubbing	lf	0.14	0.159	0.176	0.137
Inlets, flume, concr	ea	174.92	166.28	152.84	148.73
Iron, cast	lb	0.271	0.274	0.310	0.254
Manholes, adjust	ea	55.91	53.10	140.91	48.18
Markers, safety type traffic, pavement	sta	47.75	32.05	46.92	20.38
Manipulation bit seal CM	sta	4.57	4.77	4.17	3.99
SCM	sta		5.43	4.64	4.20
SAST	sta	6.18	6.28	5.82	5.63
DAST	sta	7.22	8.58	8.06	8.75
bit surf course, dense gr	t	0.97	0.90	0.91	0.701
A-B base course	t	0.28	0.36	0.32	0.282
subgr modification	sta	14.76	19.44	16.90	15.00
aggr-asph base crse	t	0.80	0.87	0.80	0.68
soil-cmt base crse	sta	103.09	110.00		50.00
Oil, cutback asph RC	gal	0.125	0.132	0.135	0.137
MC	gal	0.119	0.124	0.128	0.126
asph road oil SC	gal				
asphalt cement AC	gal	0.112	0.110	0.119	0.111
Pavements, conc, unif 6"	sy	5.26	4.71	5.59	5.40
7"	sy	4.25	4.50	4.80	5.00
8"	sy	5.14		6.52	6.00
9"	sy	4.43	4.57	4.66	4.25
10"	sy			5.54	5.40
binder course patch	t	22.88	16.57	22.69	22.57
widen	sta	23.96	17.23	27.92	20.94
conc base course 7"	sy	4.28	4.69	4.84	5.21
8"	sy	5.40	4.80		
bit fill brick rem & relaid	sy	5.00		4.00	
Piles, points	ea	4.89	4.97	5.27	5.65
steel driving	lf	1.75			
steel, 10"	lf	4.37	5.08	6.58	4.55
12"	lf	5.73	6.27		
test	lf	7.37	8.07		
treated	lf	3.27	3.36	3.23	3.47
untreated	lf	2.27	3.07	2.80	2.50
test	lf	6.01	8.03	7.89	8.00
treated test	lf		5.00	10.00	
concrete	lf	6.99	7.24	7.39	7.33
optional types	lf		4.85	5.27	5.12
Pipe, cross road, 18"	lf	3.73	3.57	3.93	na
24"	lf	4.84	5.27	5.40	na
30"	lf	6.11	6.89	6.64	na
36"	lf	8.65	8.72	9.77	na
42"	lf	10.87	11.96	12.35	na
48"	lf	12.64	13.60	14.68	na
60"	lf		25.00	21.29	na
entrance, 12"	lf		2.50	2.53	
15"	lf	2.98	3.45		3.50
18"	lf	3.34	3.40	3.64	3.95
24"	lf	4.66	4.79	4.96	4.99
30"	lf	6.11	6.05	6.26	6.31
36"	lf	8.74	8.93	9.44	9.43
42"	lf	10.21		13.22	
48"	lf	12.00	13.54	14.57	15.00
side road, 18"	lf	3.67	3.72	4.13	4.03
24"	lf	4.78	5.11	5.31	5.41
30"	lf	6.09	6.63	6.47	6.74
Pipe, cross road (Cont'd) 36"	lf	8.32	9.54	9.66	10.45
42"	lf	10.49	11.16	13.33	11.49
48"	lf	11.86	12.35	14.10	14.23
met arch, 1.1 sf MWW	lf	3.26	3.83	4.41	3.61
1.5 sf MWW	lf	3.73	4.18	4.29	4.23
2.2 sf MWW	lf	4.02	4.20	5.39	
2.8 sf MWW	lf	5.10	5.48	6.05	6.17
4.4 sf MWW	lf	6.28	6.62	7.20	7.45
6.1 sf MWW	lf	9.52	10.42	11.47	11.09
8.6 sf MWW	lf	11.03	12.68	13.32	13.18
11.0 sf MWW	lf	13.02	13.93	15.24	15.17
13.7 sf MWW	lf	16.70	16.86	21.32	21.00
16.8 sf MWW	lf	24.55	28.00	25.35	
storm sewers, 12"	lf	2.63	3.67	3.50	4.00
15"	lf	3.68	3.35	3.78	3.54
18"	lf	4.04	4.14	4.17	4.22
21"	lf	5.65		5.47	4.58
24"	lf	5.19	5.86	6.41	6.56
30"	lf	7.16	7.39	8.56	8.45
36"	lf	9.80	11.27	11.40	12.80
erosion, bit ctd 15"	lf	4.50	5.93	4.97	4.50
18"	lf	4.59	6.34	5.90	9.50
24"	lf	6.44	7.64	7.22	8.79
30"	lf	7.58	10.99	10.76	9.00
36"	lf	12.47	11.42	12.50	
42"	lf		14.00		
Posts, guide wood	ea	4.74	4.85	4.69	4.84
rem	ea	0.77	0.80	1.29	0.97
reset	ea	2.50			2.65
Rail, bridge handrail metal	lf	4.64	4.59	5.10	4.46
aluminum	lf		6.26	9.20	8.85
Riprap light stone	sy	4.00			
heavy stone	sy		6.05		
reinf conc	sy	4.84	6.05	5.74	7.12
Shoulders	sta	29.54	33.07	33.18	29.31
Sidewalk constr 4"	sy	4.15	4.53	4.43	4.44
6"	sy	5.27	5.19	5.03	5.00
Signs, refl adv warn	ea	44.28	41.54	40.00	42.14
RR crossing	ea	160.97	144.75	151.86	173.83
Steel, reinf bridge	lb	0.123	0.128	0.132	0.137
culv & misc	lb	0.127	0.133	0.138	0.141
structural	lb	0.149	0.163	0.180	0.196
erect struct	lb	0.030	0.027	0.040	
Structure, rem exist.	ls	952.71	1,237	1,098	1,109
Subbase, granular 4"1	sy	0.426	0.433	0.487	0.381
Surfacing, aggr BMA	t	1.97	2.06	1.79	1.30
binder course HM	t	6.32	6.22	6.16	4.73
surf course HM	t	6.56	6.26	6.20	5.04
cover matl CM	cy	3.56	3.48	3.05	2.77
SCM	cy		5.19	6.14	3.96
SCM	t			4.13	4.29
combined matl AB	t	1.31	1.72	1.66	1.68
light tp SA-1 to 7	cy	2.10	2.70	1.93	2.42
SS-1 to 17	cy	2.19	2.21	1.79	1.57
resurf & surf matl	cy	2.88	2.93	2.67	2.84
aggr subgr modif	cy	2.38	2.72	2.09	2.00
blanket underdrain	t	2.60	3.69	3.00	2.80
asphalt base AA	t	1.86	1.76	1.47	1.20
soil-cmt base crse.	t	1.24	1.04		1.00
Trees, large	ea	14.37	16.53	14.98	19.04
Water, for base constr	Mgal	2.16	2.65	2.28	2.15

. . . Highway Prices for the State of Oregon

Average Unit Prices Bid by Successful Contractors on 1956 Highway Construction as Reported By Oregon State Highway Department

Excavation

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Drainage, uncl	92	cy	76,180	$2.77
Common, uncl	59	cy	8,734,200	0.435
Solid	3	cy	127,200	1.262
City street	13	cy	32,530	1,147
State parks	3	cy	8,740	0.867
Genl, uncl, haul incl	5	cy	51,500	0.392
& dispos of excess	1	cy	1,300	1.00
Dispos of excess matls	3	cy	69,380	0.41
Toe, common	2	cy	10,800	1.00
Special borrow, uncl incl haul	12	cy	227,760	0.77
haul extra	9	cy	392,500	0.46
Common, haul extra	1	ymi	104,000	0.35
Solid rock, haul extra	1	cy	23,000	1.00
Truck haul, spec borrow	9	ymi	1,017,800	0.19
Dispose of excess matl plus exc	1	cy	2,400	0.60
Borrow fill i pl	1	cy	300	1.50
Embank ip, emb meas, haul incl	3	cy	138,400	0.33
Overhaul, short	27	ysta	19,500,600	0.007
long	27	Cysta	442,598	0.43
Truck haul	3	ymi	1,315,100	0.227
Finish roadbed & slopes	45	mi	95.58	637.18
Rounding cutbanks	29	lf	220,730	0.18
Roadbed grading	1	mi	4.2	2,500
Prep exist shoulder area	1	mi	10.47	250.00
Bld grader, 22,200 min	4	hrs	226	10.78
18,500 min	10	hrs	840	10.46
Dump trucks, 7 yd min.	1	hrs	100	8.50
5 yd min	3	hrs	1,790	6.55
Tractor & dozer, 155 min DB, HP	6	hrs	710	15.25
62 min HP	2	hrs	300	11.50
loader, 60 hp, 1¼ cy	1	hrs	20	15.00
& scraper	1	hrs	160	18.00
Power shovel, ¾ cy min bm & cl shl bucket	2	hrs	110	12.45
back hoe ⅜ cy min	2	hrs	650	15.92
Air compressor, 105 cf, min	2	hrs	160	7.75
Jackhammers, 51 lb min	2	hrs	160	2.50
Explosives	2	lbs	3,500	0.64
Slopers	1	hrs	256	4.68

Concrete Pipe

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
sewer, 6"	2	lf	114	1.19
8"	20	lf	13,256	1.72
10"	2	lf	720	2.78
12"	14	lf	12,880	2.33
15"	9	lf	6,510	3.19
18"	11	lf	6,220	3.45
21"	4	lf	2,200	4.56
24"	5	lf	3,090	4.74
24", reinf	1	lf	400	5.00
30"	2	lf	1,640	8.24
30", reinf	1	lf	260	7.50
36"	1	lf	40	9.00
Concrete pipe (Cont'd)				
culvert 12"	38	lf	18,431	2.17
18"	38	lf	25,099	3.49
24"	18	lf	3,454	4.95
24", ES	1	lf	230	4.30
30"	7	lf	824	7.92
30", ES	1	lf	190	5.65
36"	13	lf	2,450	9.07
42" ES	1	lf	150	12.00
48"	4	lf	580	11.02
48", ES	1	lf	140	13.60
siphon, 24"	1	lf	80	5.00
drain, 6"	1	lf	120	1.50
8", perf	1	lf	550	1.60
conc cleanout boxes	1	ea	2	100.00

Corrugated Metal Pipe

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
culvert, 8"	2	lf	130	1.87
10"	1	lf	90	2.50
12"	14	lf	4,306	3.18
12", 14 ga	1	lf	70	5.75
18"	20	lf	9,516	4.63
18", 12 ga	2	lf	380	6.06
18", uncoated	2	lf	90	7.22
24"	15	lf	2,518	6.91
24", uncoated	1	lf	40	10.00
24", 12 ga	1	lf	300	9.00
30"	3	lf	320	9.40
30", 10 ga	1	lf	900	15.00
36"	10	lf	584	13.54
36", 10 ga	1	lf	230	14.00
36", 8 ga	1	lf	900	17.50
42"	1	lf	40	16.50
48"	6	lf	494	18.87
Prot inv, 48",10 ga	1	lf	300	25.00
48", 8 ga	1	lf	370	28.00
culvert, 60"	2	lf	190	30.00
72"	4	lf	1,050	40.44
72", 12 ga	1	lf	140	63.00
72", 10 ga	1	lf	80	75.00
78", uncoated	3	lf	956	41.70
84"	1	lf	100	50.00
84", uncoated	1	lf	290	50.00
CM struct plate, 96", 12 ga	1	lf	90	95.00
108", 10 ga	1	lf	128	70.00
131", 8 ga	1	lf	140	75.00
arch, 137", 10 ga	1	lf	72	70.00
171", 7 ga	1	lf	140	200.00
CMP drain, uncoated, 6"	15	lf	16,130	1.73
6"	2	lf	260	1.72
8"	6	lf	1,005	2.36
8" perf, unctd	14	lf	57,810	1.70
12"	1	lf	1,300	3.50
12" perf, unctd	2	lf	2,810	3.04
15"	1	lf	460	4.00
CMP Arch, 18"	2	lf	260	4.38
22"	3	lf	620	4.85
29"	1	lf	40	9.00
36"	1	lf	110	13.00
43"	2	lf	560	14.71
65"	1	lf	66	25.00
CMP, asbestos bonded 10"	1	lf	150	4.50
12"	1	lf	170	5.00
18"	1	lf	230	4.95
42"	1	lf	110	26.00
ellipt inlets 15"	1	ea	4	65.00
36"	1	ea	1	150.00
prot inv 36"	1	ea	4	120.00
48"	1	ea	2	300.00
elliptical inlets 72"	1	ea	2	650.00
tide gate, 12"	1	ea	1	35.00
24"	1	ea	1	150.00
36"	2	ea	2	325.00
42"	1	ea	1	420.00
Half circle, 18"	3	lf	396	3.53
Catch inlets, metal	1	ea	10	43.00
Met end sect, ctd, 12"	2	ea	28	27.43
18"	4	ea	21	41.57
Asbestos bonded, 36"	1	lf	22	15.00

Miscellaneous Pipe Work

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Salvag culvert pipe	11	lf	1,380	2.37
Sand backfill	1	cy	20	30.00
Spec backfill in drns	24	cy	9,746	6.66
Extra, pipe under pave	17	lf	4,690	3.08
RR	1	ls	job	1,200
Haul & place backfill	1	cy	260	4.00
Pit-run backfill	1	cy	600	2.65
Grouted rock inlets & outlets	1	cy	60	100.00

Miscellaneous Street Work

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Rem asph traf mrkrs	1	lf	700	0.25
catch basins	15	ea	104	16.81
curbs	12	lf	28,630	0.28
curbs & gutters	3	lf	2,420	0.50
conc & masonry	3	cy	134	8.46
inlets	1	ea	1	30.00
manholes	1	ea	1	100.00
pavement	13	sy	21,475	0.81
walks	5	sy	1,060	0.566
walks & driveway	10	sy	6,030	0.66
Cutting walks & drvwys	1	lf	5,000	0.20
Conc catch basins, spec	5	ea	29	109.65
std	33	ea	449	71.90
curbs	27	cy	3,567	44.20
curbs & gutters	4	cy	840	41.60
driveways	3	sy	622	5.26
inlets	4	ea	17	105.23
manholes	19	ea	124	229.11
inlets, spec	1	ea	1	120.00
walks	14	sy	5,980	3.65

(Continued on page 275)

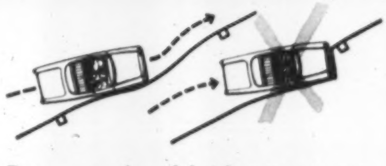
NEW
GRANCO
GUARD
RAIL!

AVAILABLE NOW! Granco Steel Products Company, leading building-products manufacturer in the Midwest, introduces new deep-beam Guard Rail for highways and bridges—available through distributors in principal cities.

HI-STRENGTH VISUAL BARRIER. Tough carbon steel. Corrugated shape. Acts as a continuous impact-resistant beam. Highways—12-gage; bridges—10-gage. Force of collision is absorbed by posts on *both* sides of the impact. Highly visible, reflects light day and night.

GREATER SAFETY. Granco Guard Rail reduces highway hazards, minimizes serious accidents and road "hogging," inspires driver confidence, channels out-of-control vehicles back onto road with least damage, lessens danger to other cars.

NO POCKETING! Guard Rail deflects cars *parallel* to roadway, can't trap them in a collapsing pocket (see drawing).



Beam strength and height prevent cars from hurtling over or going under rail. Flared end sections help prevent cars from hitting the end of a rail head on.

INTERCHANGEABLE SECTIONS. Standardized units have been adopted by American Association of State Highway Officials. Damaged sections do not impair efficiency of undamaged sections, may be rolled out and re-used.

ECONOMICAL. Sections nest conveniently for compact shipment, are easy to handle and install. Accessories are furnished with rail. Granco Guard Rail is painted with a rust-inhibitive primer, uniformly applied by "flow coating" and then baked to a hard-enamel finish.

IDEAL FOR BRIDGES. Granco Guard Rail provides a safe approach, permits maximum use of roadway, reduces center-line crowding, protects trusses.

NEW PRODUCT MANUAL! Contains eight pages of application photographs, standard drawings, specifications, curving data, installation instructions and facts on non-highway use. WRITE FOR YOUR FREE COPY TODAY. Attn.: Dept. E-711.

GRANCO

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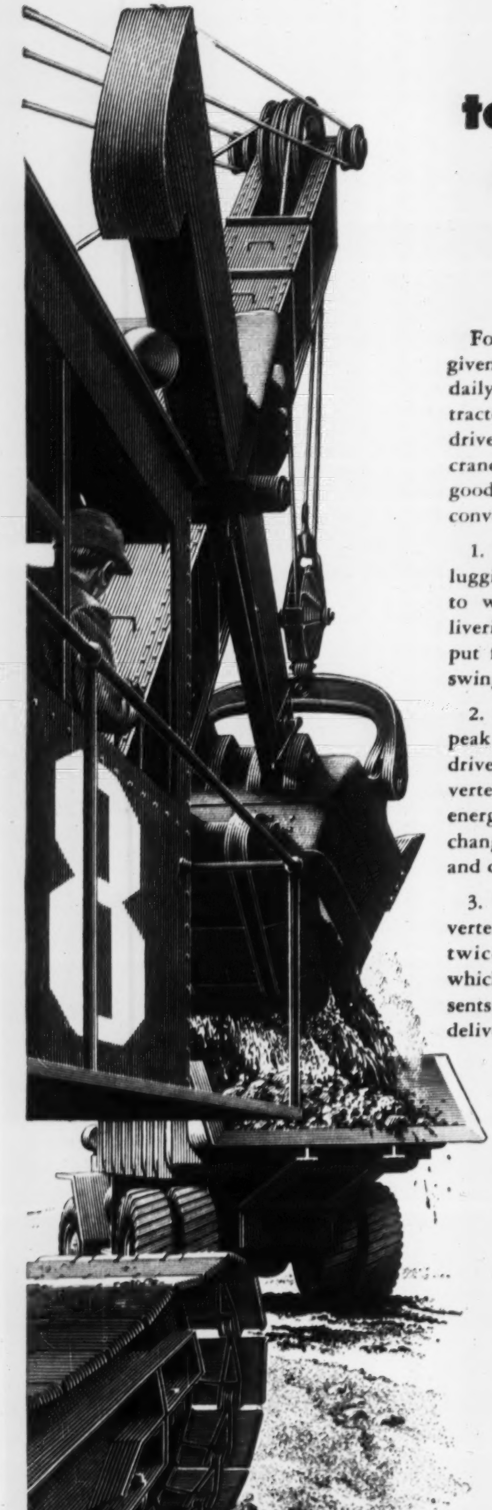


Here's why torque converter equipped machines do *more* work at *lower* operating cost

For higher work capacity on any given load, and for greater all-round daily production, more and more contractors are specifying torque converter drives in their new excavators, erecting cranes and loaders. And here are five good, profitable reasons why the torque converter is the preferred type of drive:

1. The torque converter eliminates lugging and stalling . . . permits engines to work at maximum efficiency delivering constant high-horsepower output for heavy digging loads and fast swinging.

2. *Smooth* converter power reduces peak loads throughout the machine's drive train because fluid within the converter absorbs much of the impact energy caused by quick drum speed change . . . thus protecting *both* driving and driven equipment.

3. When necessary, the torque converter smoothly delivers approximately twice normal torque to the drum, which, at slow digging speeds, represents an important advantage in power delivered to the dipper.

4. Cable life is extended since no sharp impact loads ever reach cables through the torque converter . . . constant line tension is maintained . . . there's no jerking or snapping.

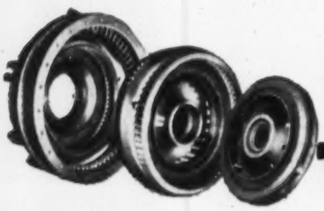
5. An infinite variety of ratios is available to work with . . . permitting smooth, accurate, *safe control* of loads and delicate "inching" and "holding" under power . . . as well as adjusting for wide variations in dipper loading, substituting greater digging effort for speed, when required.

Wherever earth and rock are moved, wherever steel is erected, you'll find contractors using these five advantages *. . . to convert their horsepower into greater-than-ever profits!*

• • •

Twin Disc Torque Converters—*three-stage* or *single-stage,* from 30 to 1000 hp—are available from all leading manufacturers of heavy-duty machines. Be sure to specify one in your next unit. Take advantage of the five reasons why torque converter equipped machines do *more* work at *lower* operating cost.

Twin Disc is the world's leading manufacturer of friction clutches and fluid couplings for heavy-duty industrial applications . . . and the only manufacturer producing *both* three-stage *and* single-stage torque converters. Because of its complete line of industrial drives, Twin Disc can offer *unbiased* recommendations for any heavy-duty power transmission application.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES OR SALES ENGINEERING OFFICES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • TULSA

Miscellaneous Street Work (Cont'd from p. 268)

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
in islands	18	cy	1,775	36.94
end basins	1	cy	2	90.00
Drop manholes	1	ea	2	300.00
Conc stairs & walls, cl A	2	cy	30	73.33
Conc in walls, cl A	1	cy	250	48.00
box culvert	18	cy	4,486	55.33
Metal reinf, strs & walls	2	lb	1,430	0.15
walls	1	lb	39,000	0.14
box culvert	18	lbs	686,600	0.135
Head wall, spec	1	ea	1	100.00
Pine handrail	3	lf	410	5.85
Adj catch basin & inlet	6	ea	13	32.38
manholes	13	ea	103	39.66
Reconstr manholes	2	ea	8	182.50

Materials in Subbase & Base

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Coarse crushed	74	cy	807,430	2.25
Rock, 2½"	5	cy	121,450	1.78
2"	1	cy	15,000	2.52
Gravel, 1"	1	cy	26,300	2.25
Matl, ¾"	91	cy	193,268	2.46
Cinders, ¾"	1	cy	7,300	2.50
Quarry-run rock	3	cy	4,610	1.95
Crusher run cinders	1	cy	24,000	1.27
Crusher run matl	1	cy	24,000	1.30
Gravel, cushion crse	1	cy	15,300	0.40
Haul cushion crse	1	ym	23,600	0.15
Coarse matl	1	cy	6,200	0.90
Select rdbd topg, haul extra	3	cy	51,600	0.36
haul	3	ym	71,900	0.117
Stone base, haul & pl	5	cy	7,520	1.88
haul	1	ym	3,000	0.12
place	1	cy	400	0.50
Haul & place ¾"	3	cy	1,380	1.89
Pit-run matl	1	cy	650	1.50
Pit-run cinders	1	cy	27,000	1.60
Salvag surf materials	1	cy	150	1.50
Sprinkling	110	Mgal	38,815	2.53
Cr rock in stkple, haul incl: 1¼"-¾"	1	cy	660	2.74
1¼"-0	1	cy	1,000	2.60
¾"-0	4	cy	13,900	2.55
¾"-½"	8	cy	22,430	2.86
½"-¼"	8	cy	31,780	2.92
¼"-#10	8	cy	11,580	2.85
¼"-0	4	cy	11,750	2.91
⅜"-0	1	cy	3,000	2.70
haul extra: 2"-0	1	cy	6,500	1.75
¾"-0	1	cy	2,500	1.90
¾"-¼"	1	cy	850	2.30
½"x¼"	1	cy	2,500	2.30
¼"-0	1	cy	3,500	2.40
¼"-#10	1	cy	3,000	2.60
⅜"-⅛"	1	cy	4,000	2.60
Crushed rock, haul pile meas	1	ym	94,000	0.14
Cr cinders in stkple, haul incl: ¾"-½"	2	cy	3,000	2.18
½"-¼"	3	cy	9,100	2.68
¼"-#10	3	cy	2,600	2.28
½"-0	1	cy	12,000	2.45
¼"-0	1	cy	3,500	3.00
Cr gravel in stkple, haul incl: ¾"-½"	8	cy	19,170	2.82
¾"-0	3	cy	9,500	3.39
½"-¼"	8	cy	22,700	2.84
½"-#10	4	cy	6,500	3.02
⅜"-#10	1	cy	5,800	2.98
¼"-#10	8	cy	9,830	2.78
¼"-0	3	cy	7,000	3.25
Prepare base for oilg	18	mi	219.12	115.66
re-oilg	2	mi	79.64	85.10
Prepare shoulders	3	mi	54.82	146.82
Cinders f&p	4	cy	18,570	3.60
Gravel f&p	22	cy	27,290	4.15
Rock f&p	11	cy	18,380	4.15
Asph, 1st seal & oil mat wear surf, 150-20 asph	29	t	7,612	43.89
shoulders	10	t	619	42.81
RS-1 in shldrs	10	t	218	46.58
final seal	17	t	1,004	46.06
RS-2, final seal	2	t	540	39.91
RC-3	2	t	198	43.03
MC-2	1	t	120	47.00
Aggregates, haul	7	ym	163,500	0.165
place	7	cy	38,610	1.10
Matl in shlders, ¾"-0	4	cy	6,950	3.23

Asphaltic Concrete Paving

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Prepare base	28	mi	41.99	334.44
Asph conc curbs	2	lf	6,200	1.00
Extra for approaches	25	ea	926	28.50
Asph conc curbs matl in bndr crse, ¾"-0	54	cy	17,044	3.79
haul & place	1	cy	100	4.00
½"-0	1	cy	1,800	5.50
Asph, bindr crse, RC-3	41	t	1,793	47.77
RS-2	41	t	14	55.50
MC-2	12	t	961	45.73
tack coat, RS-1	23	t	739	51.87
RS-2	2	t	48	53.75
pave seal, RS-2	42	t	2,231	50.32
Agg pavement seal	44	cy	10,140	5.11
in stkple	5	cy	1,610	2.68
Asph conc mixture	70	t	407,934	4.51
Asph, 85-100	61	t	22,045	31.17
100-200	5	t	431	27.87
120-150	4	t	3,310	37.38
Asph conc, cl B	8		4,820	9.98
State agg in asph-conc mix	1		12,000	2.50
for patching	10	t	7,070	4.14
state aggr	1	t	1,700	2.50

Portland Cement Concrete Pavement

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
PC conc pave	2	sy	3,800	5.46
Reinf, wire fabric	1	lbs	23,000	0.17
Reinf & tie bars	1	lbs	2,400	0.12
Dowel bars	1	ea	400	0.10
Expan jnt in pave	1	lf	2,200	0.40
Contraction jnts	1	lf	500	0.20
Matl, cush crse, ½"-0	1	cy	100	5.00

Traffic Control

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Metal guard rail	36	lf	139,314	2.53
Metal sight posts	26	ea	3,696	2.73
Salv & reinst grd rl	2	lf	770	2.54
Rem & reinst sight posts	2	ea	48	5.44
Metal median barrier	3	lf	17,500	4.32
Asph conc traf mrkrs	17	lf	10,860	0.95

Fence

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Chain link wire mesh, 4	1	rods	590	1.81
Fence, tp I	1	rods	2,300	3.00
tp II	8	rods	11,416	5.20
tp III	2	rods	836	11.50
26" V-mesh	1	rods	2,600	3.89
Median Fence	1	rods	35	19.00
Metal Snow, 4-rail	1	rods	6,300	3.25
Deer salvag & reconst	1	rods	230	8.00
Metal gates, 14'x48"	1	ea	14	75.00
14'x50"	1	ea	22	75.00

Roadside Improvement

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Topsoil f&p	2	cy	370	2.00
exc & place	7	cy	35,830	1.06
haul & place	1	cy	9,600	1.10
Furn & plant shrubs	4	ea	7,400	2.03
vines	4	ea	39,950	0.35
trees	3	ea	545	3.64
Plant vines	2	ea	21,100	0.12
trees	1	ea	30	0.60
Elect conduit, 2"	1	lf	430	1.65
1½"	7	lf	3,600	1.48
1¼"	14	lf	3,080	1.77
1"	2	lf	640	1.40
¾"	2	lf	150	1.25
Automatic sect control valves, 2"	1	ea	7	53.00
1½"	1	ea	5	48.00
1¼"	1	ea	3	18.26
1"	1	ea	1	15.12
¾"	1	ea	4	13.24
Valves, drain ½"	1	ea	20	9.50
quick-coup hose, ¾"	2	ea	6	9.85
Salv & reinst contr vlv	1	ea	8	10.00
Sprinkler heads, pop-up, non-revolv, small	1	ea	120	2.50
Sprink hds, shrubbery	2	ea	304	1.99
Hedge, dig & repl	1	lf	650	1.05
Shrubs, dig & repl	1	ea	50	12.00
Lawn reconstruction	1	ac	0.6	1,742.00
Seed roadside areas	3	ac	15.84	128.91
Grass seed, KyBluegrass	2	lbs	100	1.03
Creep Red Fescue	4	lbs	383	0.61
Highland Bentgrass	4	lbs	308	0.86
Dutch White Clover	1	lbs	25	0.65
Perennial Rye	1	lbs	65	0.40
Fertilizer, organic 5-3-2	4	cwt	88	5.05
bone meal	2	cwt	48	5.58
Inorganic 10-16-8	2	cwt	56	5.18
10-6-4	1	cwt	11	4.10
Sawdust	5	units	507	13.32
S P, galv, 2½"	2	lf	1,730	1.43
2"	3	lf	2,240	1.09
1½"	3	lf	8,870	0.86
1¼"	3	lf	2,010	0.72
1"	5	lf	1,990	0.68
¾"	2	lf	2,400	0.54
½"	2	lf	2,650	0.47
S P ctd, irrig sys, 18", 7 ga	1	lf	270	10.00
12 ga	1	lf	330	7.00
Overhead irrig sys	1	ls	All	2,146
Automatic sprinkler controller, 12-sect	1	ea	1	1,011

Riprap

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Concrete slab	3	sy	792	7.48
Hand placed	1	cy	400	12.00
Loose	10	cy	16,920	3.01
Sacked aggregate cement	1	cy	670	30.00
Dry rubble masonry	1	cy	200	32.50
Slope paving	1	sy	980	8.44
Qry-run rock in embank	3	cy	2,550	2.17

Bridges

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Exc struct	56	cy	24,022	6.64
below elev shown	14	cy	795	13.40
Treated timber ip	21	Mfbm	195	374.46
Piling, treat timber f	31	lf	91,388	1.67
drive	31	ea	1,956	50.77
Stl pile shells f	10	lf	5,194	3.91
drive	10	ea	150	97.07
Piling, conc cip f	7	lf	5,150	4.70
drive stl casings	7	ea	90	79.78
timber, untreat f	5	lf	39,070	0.685
drive	5	ea	813	54.00
Composite f	1	lf	2,655	2.65
drive	1	ea	47	80.00
Concrete, cl A	67	cy	36,143	66.74
Metal reinforcement	67	lbs	7,830,650	0.125
Concrete, cl A-A	3	cy	590	70.90
Treated lumber	1	Mfbm	6	350.00
Seal concrete	3	cy	2,780	34.06
Struct steel	11	Lb Est	5,214,792	0.253
Metal rail	14	lf	12,888	9.70
Met drain pipe, 8"	37	lf	3,174	3.65
12"	1	lf	160	5.00
Conc handrail	4	lf	1,345	11.22
Stl pil 12" BP, 53# f	1	lf	275	7.00
10" BP, 42# f	2	lf	1,200	5.50
14" BP, 73# f	1	lf	550	11.00
drive	4	ea	46	96.95
Retain wall pipe rail	1	lf	60	6.00
Navigation lights	1	ls	All	5,000
Med barrier on struct	1	lf	144	9.00
Inspection walk	1	ls	All	6,000

State Parks

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Construct latrine	7	ls	All	52,051
shelter & latrine	1	ls	All	5,700
kitchen shelter	1	ls	All	3,125
pump house	1	ls	All	2,250
workshed	1	ls	All	3,190
utility bldg	1	ls	All	7,200
Sanitary water sys	3	ls	All	6,150
Drink water sys	2	ls	All	1,920
Water, waste & elect sys & camp facil	1	ls	All	4,380
Trailer wste disp sys	2	ls	All	4,550
Trailer elect sys	2	ls	All	3,300
Enlarg std latrine	1	ls	All	3,350
small latrine	1	ls	All	1,630
Picnic tables	3	ea	115	44.32
Camp wood stoves	3	ea	115	47.22

Aerial Photography

Items	No. of Contracts	Unit	Quantity	Average Unit Bid
Aerial photography	2	ls	All	4,700
Photo. contact prints	2	sets	5	381.00
index maps	2	sets	6	112.50
Aerial mosaic	1	sq mi	330	13.00
print	1	sets	3	420.00
Topographic mapping	1	sq mi	17	870.00
Survey monuments ip	1	ea	70	30.00
Plane, pilot, photo & camera f	1	hrs	120	24.00
Acc aerial vert exp f	1	ea	1,300	2.00
Acc aerial obliq exp f	1	ea	100	5.00

Highway Prices for the State of Florida

Bids Received, 1957—1st half Item	Unit	Unit Prices Bids Received Q1	Q2
Excavation, regular	cy	$0.366	$0.373
borrow	cy	0.484	0.532
lateral ditch	cy	0.431	0.658
subsoil	cy	0.505	0.549
average	cy	0.445	0.515
Grading	rdmi	18,294	14,944
Embankment	cy	0.694	1.213
Base, sand clay, primed 6½"	sy	0.447	0.728
limerock, primed 6½"	sy	1.304	1.352
8"	sy	1.419	
8½"	sy	1.431	1.818
stabilized	cy	3.856	3.462
primed	sy	0.201	0.223
Bit matl, surf treat AC 150-200 pen	gal	0.176	0.173
pl mix & tack coat	gal	0.139	0.153
SBRM cutback asph	gal	0.132	0.204
Cover matl for type 2	cy	8.786	8.891
Sand asph hot mix, variable thick	t	4.413	4.67
Asph conc surf crse, tp 1, 1" with binder crse, 1½"	sy	0.841	0.900
tp 1, 1"	sy	0.432	0.49
tp 1, var	t	6.143	7.76
tp 11, var	t	5.920	7.11
Concrete, cl A bridge	cy	63.03	62.363
headwalls & misc	cy	70.98	66.71
culverts	cy	64.94	68.276
average	cy	64.58	63.288
Pave, conc, cement, plain 7"	sy		3.873
reinf, 9"	sy		10.318
Concrete handrail	lf	6.22	4.204
approach slabs	ea		817.29
Steel, reinf	lb	0.137	0.135
structural	lb		0.1923
Conc P culv side drain, 15"	lf		4.63
cross drain, 15"	lf	3.16	3.945
storm sewer, 15"	lf	4.79	5.77
side drain, 18"	lf	4.51	5.40
cross drain, 18"	lf	5.52	5.39
storm sewer, 18"	lf	5.87	7.33
side drain, 24"	lf	7.01	8.26
cross drain, 24"	lf	6.49	6.86
storm sewer, 24"	lf	8.01	9.59
cross drain, 30"	lf	12.71	10.14

(Continued on page 276)

. . . Florida Highway Prices

(Continued from page 275)

Bids Received, 1957—1st half Item	Unit	Unit Prices Bids Received Q1	 Q2
Concrete pipe (Cont'd.)			
storm sewer, 30"	lf	11.44	13.27
cross drain, 36"	lf	24.11	13.43
storm sewer, 36"	lf	15.32	16.51
side drain, 42"	lf	18.02	17.50
cross drain, 42"	lf	19.16	16.25
storm sewer, 42"	lf	19.11	22.94
cross drain, 48"	lf	22.11	23.73
storm sewer, 48"	lf	23.09	29.86
cross drain, 54"	lf	21.23	26.28
storm sewer, 54"	lf	25.73	34.90
storm sewer, 60"	lf		41.84
side drain, 18"	lf	5.23	4.78
24"	lf	6.02	6.52
Piling, treated timber	lf	3.86	2.90
struct	Mfbm		438.79
precast conc, 12" sq	lf	6.25	7.63
14"	lf	6.88	8.15
18"	lf	8.80	9.44
Riprap, sand cement	cy	34.84	35.38
Ditch pave, conc 3"	sy	3.72	3.90
slope, 4"	sy		4.40
Conc curb, header curb 8"x20"	lf	2.50	2.22
tp A Median	lf	1.68	1.76
tp B	lf		1.93
barrier	lf		2.83
& gutter	lf	1.72	1.87
valley	lf		2.63
sidewalk 4"	sy	3.55	3.98
6"	sy	4.93	4.86
Markers, right of way, instal only	ea		2.34
Guard rail, metal	lf	3.33	3.03
min 10 ga	lf	3.18	
Grassing	sy	0.034	0.036
Grassing & mulching	sy	0.043	0.0475
Mulch material	t	42.70	45.78
Shell base material	cy	4.59	5.955
stabilized, primed	sy	0.23	0.339
Calc chlor for dust control	t		80.22
Steel piling 12 BP 53 furn	lf		4.80
driven	lf		0.50
14 BP 73 furn	lf		6.00
driven	lf		1.75
Piling, conc sheet 7"x30"	lf		6.40
10"x30"	lf		7.50
Inlets	ea		323.63
Manholes	ea		343.45
Conc traffic separator 4'	lf		4.18
6'	lf		5.00

Highway Reconstruction in Massachusetts

Reconstruction of this existing highway in Essex and Ipswich, Massachusetts, in part on new location to improve alignment and in part on old location, represents problems that turn up with increasing frequency. The route must be kept open to travel during construction. Class A rock excavation is scattered along the widenings with costs reflecting frequent moves of drilling equipment to handle relatively small quantities. Bridge structures are now new but are widenings as are also culvert extensions. The job is about 3 miles long and calls for a 40 ft undivided roadway through a rural area.

These difficulties did not intimidate ten bidders, but three, including the next-to-low were informal and were thrown out. Coleman Bros. Corp., Readville, Mass. took the contract at $6,198,813 just 1% under the third low and almost 4% under the engineer's estimate. H. G. Gray is chief engineer, Department of Public Works, Commonwealth of Massachusetts.

The bidding included:

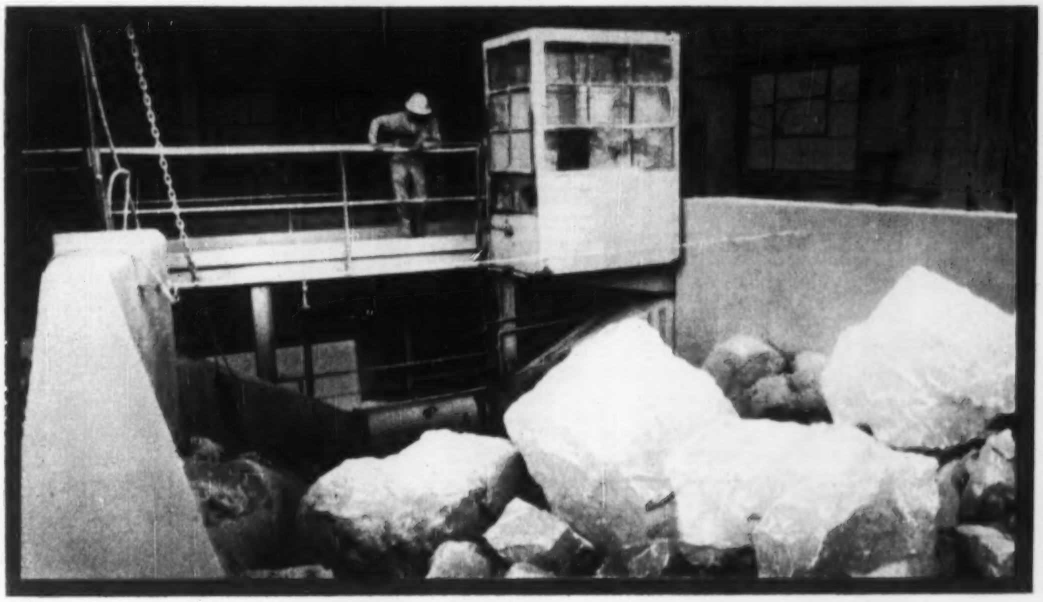
1C	Coleman Bros Corp., Readsville, Mass	$6,198,813
3	Wes-Julian Const Corp., Dedham, Mass.	6,286,167
10	Berke-Moore Co. Inc., Boston, Mass	7,257,001
EE	The Commonwealth of Mass., Dept of Public Works, Boston, Mass.	6,431,001

Bids: 1-15-57 Items	Unit	Quantity	Unit Prices 1 C	 3
Exc, roadway earth	cy	92,000	$1.00	$1.50
cl A rock	cy	3,400	4.00	3.00
bridge	cy	19,950	4.00	4.00
cl A trench	cy	3,000	3.00	5.00
cl B trench	cy	10,100	5.00	8.00
cl B rock	cy	15	13.00	15.00
reinf, conc	cy	950	10.00	10.00
reinf, conc surf	cy	300	7.00	7.00
CB or MH abandoned	ea	36	40.00	25.00
Trees rem, under 24"φ	ea	33	40.00	25.00
24" or over	ea	10	90.00	75.00
Borrow, ordinary	cy	141,000	1.50	1.80
gravel	cy	51,000	2.00	2.00
sand	cy	10	6.00	5.00
gravel for br fndns	cy	4,600	2.50	2.50
Grading, rolling & finish	sy	96,000	0.13	0.12
Crush stone base crse	t	13,600	3.50	4.00
for slopes	t	900	3.00	3.50
Bit, rdwy base crse	gal	100,000	0.16	0.15
Dust control, cal chl	lb	30,000	0.06	0.05
bitumen	gal	7,300	0.17	0.15
Macadam surf, crushed stone	t	600	4.00	4.00
bitumen	gal	12,000	0.17	0.15
Bit conc pave tp I-I, cl I	t	8,900	6.80	8.00
Bit, for tack coat	gal	110	0.50	0.40
Bit conc berms, cl I	t	65	20.00	18.00
Steel sheeting	lb	147,000	0.18	0.15
Pile loading test, 14BP-73	ea	4	2,000	3,000
14BP-117	ea	1	2,000	4,000
Cmt conc masonry, cl A	cy	530	30.00	30.00
cl B	cy	900	45.00	50.00
cl C	cy	800	35.00	40.00
Steel reinf, structures	lb	73,200	0.15	0.15
structural	lb	41,250	0.24	0.30
Bit damp-proofing, walls	sy	850	1.00	0.80
Lumber	Mfbm	4	400.00	300.00
Rem present superstr	ls	1	4,000	10,000
MTA pedes	ls	1	1,300	10,000
Met bridge railg, TH	lf	200	25.00	15.00
Steel piles 14BP-73	lf	47,200	7.25	8.50
14BP-117	lf	3,500	11.00	13.00
splices 14BP-73	ea	66	50.00	75.00
14BP-117	ea	4	80.00	150.00
Catch basins	ea	74	180.00	175.00
with concord fr & grt	ea	27	180.00	200.00
city Boston TB-1	ea	42	350.00	300.00
Manholes	ea	40	180.00	200.00
9' to 14' depth	ea	4	400.00	400.00
sanitary, city Boston	ea	2	400.00	350.00
9'-14', ex cos of cast	ea	2	600.00	500.00
14'-18'	ea	4	1,000	700.00
22'-26'	ea	2	2,500	2,000
spec	ea	8	800.00	750.00
spec, ex cos of cast	ea	2	2,000	700.00
CB city of Boston Tp Bl, ex cos of cast	ea	5	450.00	250.00
Gutter inlet	ea	1	110.00	150.00
Sewer junction chamber	ls	1	31,000	25,000
Tide gate MH connect chmbr	ls	1	20,000	20,000
CB, MH or LB adj to L/G	ea	30	25.00	25.00
CB or MH, chg in type	ea	2	100.00	100.00
Fr & gr or fr & cov f&i	ea	1	60.00	100.00
Hood & gate assemb, 12" P f&i	ea	39	40.00	75.00
Fr & gr or fr & cov rem & stack	ea	10	10.00	10.00
Bradley heads adj to L/G.	ea	2	50.00	50.00
Vitr clay pipe, 8"	lf	80	6.00	4.00
10"	lf	4	7.00	6.00
12"	lf	210	8.00	6.00
15"	lf	20	12.00	15.00
20"	lf	8	15.00	25.00
24"	lf	300	16.00	25.00
Reinf conc pipe, 12"	lf	6,300	4.00	3.50
18"	lf	1,760	5.50	5.50
24"	lf	1,100	8.00	8.50
24" 350/OD	lf	670	9.00	25.00
30"	lf	1,060	10.00	10.00
36"	lf	850	13.00	16.00
42"	lf	50	20.00	18.00
42" 300/OD	lf	190	22.00	20.00
78"	lf	630	60.00	75.00
ACCM pipe, 12"	lf	140	5.90	4.50
18"	lf	80	7.00	6.00
24", 8 ga	lf	580	16.00	15.00
Cl pipe, 24" hvy	lf	380	25.00	20.00
30" hvy	lf	160	38.00	50.00
12" lgt	lf	30	10.00	8.00
Weld Wl pipe, ES, 12"	lf	40	50.00	100.00
ACCM pipe, perf, sub-dr, 8"	lf	3,850	5.00	4.00
Bit mix pave waterways	sy	140	3.00	4.00
Hwy gd, stl beam, T HDS	lf	4,000	3.50	3.25
rem & reset	lf	1,500	1.00	0.90
Fence, chain link, 48"	lf	600	3.00	2.50
72"	lf	7,400	4.20	3.50
72", with barb wire	lf	830	4.50	4.00
Gates, chn lnk with psts				
48"	lf	7	10.00	10.00
72"	lf	58	17.00	15.00
72", with barb wire	lf	76	17.00	15.00
Fence, chn lnk, rem, reset				
72"	lf	580	1.50	1.50
84"	lf	280	1.70	1.50
barrier	lf	80	11.00	10.00
portable	ea	20	90.00	75.00
lighted	lf	350	30.00	40.00
chain link, rem & stack	lf	400	0.50	0.50
Gran curb T VA3, straight	lf	900	4.00	3.60
T VA4, straight	lf	4,250	3.70	3.40
curved	lf	950	5.00	5.00
inlets, straight	ea	84	34.00	37.00
curved	ea	10	42.00	48.00
Gr edg tp SB, str or gr fac				
prec conc edg TB str	lf	12,500	1.80	1.80
rad 10' or less, curved	lf	120	5.50	5.30
Curb, rem & reset	lf	5,600	1.20	1.50
inlets rem & reset	ea	19	13.00	15.00
corners rem & reset	ea	10	10.00	15.00
rem & stack	lf	250	0.50	1.00
corners rem & stack	ea	39	5.00	2.00
Conc sidewalks, 2-course	sy	3,000	5.00	5.00
Bit conc walk surf	t	420	15.00	12.00
Stone dust walks	t	30	8.00	5.00
Traf signal conduit, 3"	lf	15,000	1.10	1.40
4"	lf	4,820	1.30	1.60
stl, 2"	lf	800	3.50	1.75
stl, 3"	lf	2,200	2.50	2.75
WI, 3"	lf	180	4.00	4.00
Met bin-type retain wall	sf	6,500	7.00	7.00
Bounds, lettered gran f&s	ea	60	35.00	33.00
plain gran f&s	ea	6	30.00	30.00
Proj markers f&s	ea	2	100.00	25.00
Demol bldg #1	ls	1	900.00	750.00
#21	ls	1	110.00	100.00
#22	ls	1	100.00	100.00
#24	ls	1	100.00	100.00
#31	ls	1	850.00	750.00
#32	ls	1	850.00	750.00
#33	ls	1	850.00	750.00
#34	ls	1	850.00	750.00
#44	ls	1	900.00	4,000
Bridge structure B16-256	ls	1	361,000	350,000
B16-259	ls	1	3,533,000	3,370,000
B16-266	ls	1	233,000	250,000
Relocat pedest overpass	ls	1	40,000	35,000
Playground equip, rem & stack	ls	1	400.00	50.00
Elect MH, TE-1, ex cos of cast	ea	2	800.00	300.00
TE-2, ex cos of cast	ea	2	500.00	300.00
MTA MH Boston Elev Rwy, ex cos of cast	ea	6	1,500	500.00
spec	ea	1	500.00	400.00
Flasher beacons	ea	3	900.00	1,200
Control house	ls	1	7,000	10,000
Pull boxes	ea	49	100.00	100.00
Lighting, underbridge	ls	1	2,200	2,500
maint area	ls	1	3,000	3,000
Hydraul fill for 6' sewer	ls	1	9,700	10,000
Overhead destin sign				
OD#1	ea	1	3,000	3,250
OD#2	ea	1	4,000	3,250
OD#3	ea	1	3,800	3,250
Loam borrow	cy	4,800	3.00	3.50
Seeding	sy	36,000	0.08	0.10
Cl water main cmt lin,				
6"	lf	70	6.00	9.00
8"	lf	300	8.00	9.00
12"	lf	2,000	11.00	15.00
16"	lf	1,200	20.00	22.00
20"	lf	280	30.00	30.00
Water Sp, ES, 12"	lf	130	15.00	30.00
16"	lf	340	16.00	35.00
20"	lf	130	40.00	40.00
Hydrants, remov & reset	ea	7	200.00	200.00
remov & stack	ea	2	100.00	100.00
Gates & gate boxes, 6"	ea	2	120.00	125.00
12"	ea	5	350.00	350.00
16"	ea	3	800.00	700.00
20"	ea	1	1,500	1,200
6" rem & reset	ea	5	100.00	75.00
12" rem & reset	ea	3	150.00	200.00
16" rem & reset	ea	1	400.00	250.00
Gate boxes adjust	ea	16	20.00	25.00
rem & stack	ea	16	10.00	10.00
Gate valves, rem & stack	ea	16	50.00	50.00
Water meters, rem & stack	ea	3	30.00	50.00
Water connect boxes, TA	ea	2	1,000	750.00
TB	ea	2	600.00	450.00
TC	ea	2	700.00	550.00
Cl plug for water main, 6"	ea	1	30.00	10.00
8"	ea	1	40.00	15.00
12"	ea	1	60.00	25.00
Curb stop boxes adjust	ea	4	15.00	20.00
rem & stack	ea	17	13.00	10.00
Elec equip, control house	ls	1	6,000	6,000
Lighting stds, TA	ea	54	260.00	325.00
TB	ea	9	260.00	325.00
TC	ea	2	270.00	325.00
TD	ea	4	260.00	325.00
TE	ea	1	260.00	325.00
Neoprene jacket cable 600V,				
1 C#1	lf	43,000	0.65	0.50
1 C#4	lf	22,000	0.38	0.30
1 C#12	lf	10,000	0.13	0.10
Luminaire, compl with lamp	ea	74	200.00	90.00
Hand hole, compl with				
fr & cov	ea	46	90.00	250.00
at wall	ea	3	80.00	250.00

Completion Time: 3 years

MTA Metropolitan Transit Authority LB leaching basin
HDS heavy duty steel (guard rail, beam type)

Granite edging type SB elected by contractor over precast concrete



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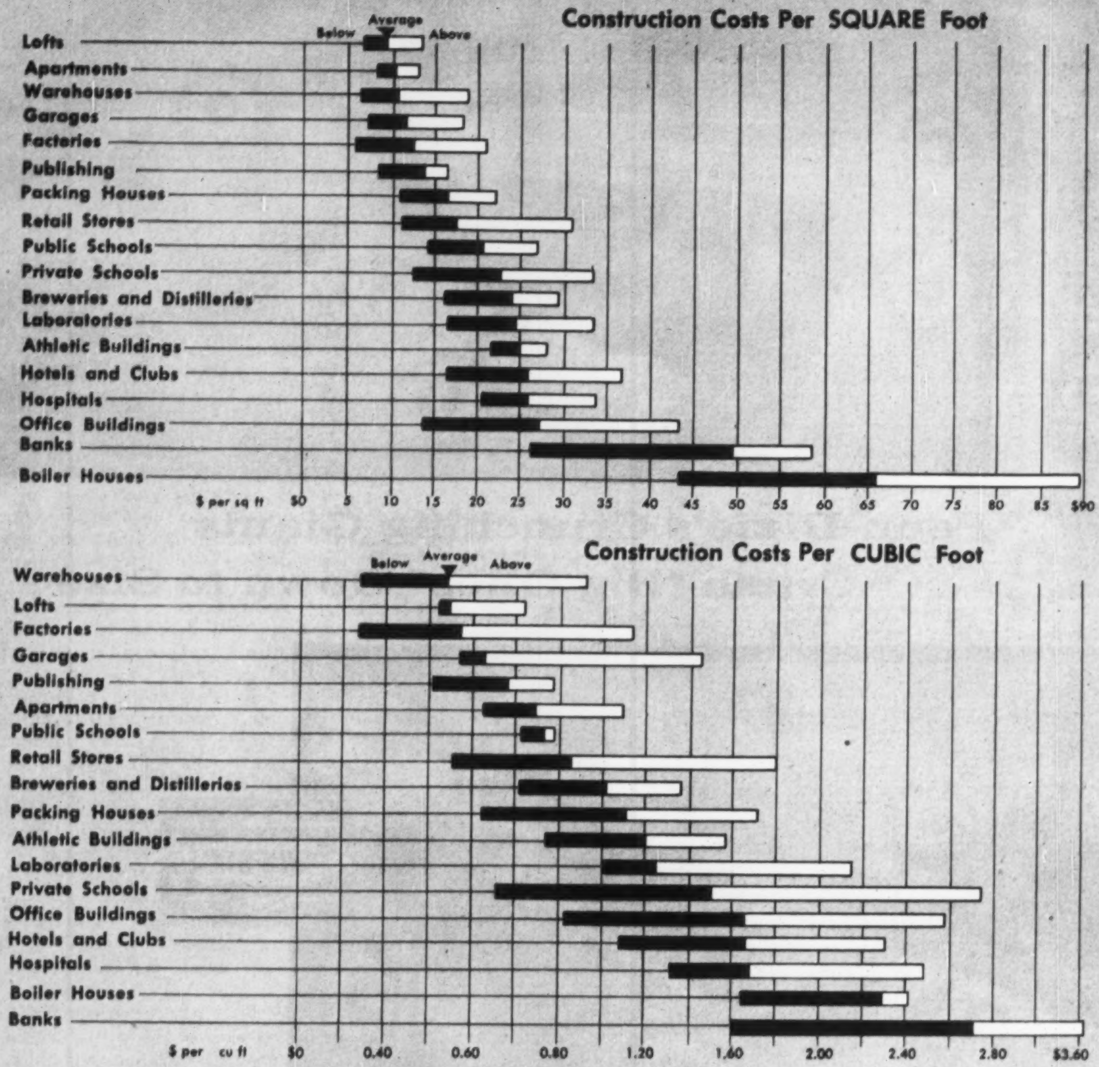
Costs of Over 300 Buildings — Constructed by the Turner Construction Co., New York



Costs adjusted to April 1957 Turner Construction C., Index 316 (1939=100); ENR Buildigg Cost Index 501 (1913=100)

HOW AND WHY INDIVIDUAL BUILDING COSTS vary from the averages is illustrated by Turner Construction Co. in the accompanying page which explains how to use these building cost ranges

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The Turner Building Cost Index is determined by periodically repricing a multi-story industrial building. The factors recognized are Turner's cost experience on labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions and a forecast of price trends

1902	58	1914	55	1926	107	1938	103	1950		235
1903	58	1915	57	1927	105	1939	100	1951		263
1904	54	1916	67	1928	105	1940	106	1952		271
1905	56	1917	81	1929	102	1941	119	1953		275
1906	59	1918	91	1930	91	1942	135	1954		269
1907	60	1919	107	1931	80	1943	142	1955		274
1908	58	1920	140	1932	75	1944	134	1956	Aver	299
1909	57	1921	101	1933	77	1945	142		Apr	295
1910	56	1922	97	1934	88	1946	175		July	300
									Oct	303
1911	55	1923	107	1935	89	1947	210	1957	Jan	310
1912	55	1924	106	1936	92	1948	233		Apr	316
1913	55	1925	107	1937	106	1949	227		July	319

How to Use the Turner Unit Building Costs

While cost per "square foot," or the cost per "cubic foot" provides a general check on building costs, the charts on the preceding page show that for a substantial number of buildings built by Turner Construction Co., New York, there has been a wide variation in costs even for buildings within the same categories.

Many factors contribute to these variations—such as the occupancy and use of the building, foundation conditions, exterior and interior treatment, mechanical facilities to be provided and the physical shape of the building.

To illustrate, using a cubic foot basis, an "average" office building, as indicated by the charts, should cost about $2.05 a cubic foot, including tenant work. A typical estimate of cost for a ten-story and basement building containing 1,440,000 cubic feet costing $2.05 a cubic foot is:

Items	Cost per cu ft
Foundations, including Piles	$0.10
Structural Frame	0.38
Exterior Walls (Limestone Facing)	0.35
Interior Partitions	0.20
Stairs	0.01
Floor Covering	0.02
Acoustical Treatment	0.08
Roofing, Sheet Metal, and Insulation	0.01
Store Front Construction, 1st story	0.02
Heating, Ventilating, and Air Conditioning	0.38
Electrical Work	0.27
Plumbing	0.10
Elevators	0.12
Miscellaneous	0.01
TOTAL, per cu ft	$2.05

So far, so good. The average cost per cubic foot as shown on the charts stands up well. However, alter any of the requirements "up" or "down" and the cubic foot cost, and therefore the total cost, will vary greatly as shown by these figures:

If:	Add or Deduct per Cubic Foot
Foundations are placed on hard rock instead of piles	−$0.06
A face brick facade is used in place of limestone	− 0.12
A granite facade is used in place of limestone	+ 0.20
Air conditioning is omitted	− 0.17
An underfloor electrical duct system is omitted	− 0.05
Plastered ceilings are substituted for acoustical tile	− 0.03
Outside parking facilities are provided	+ 0.03

With these few changes, the cubic foot cost that was $2.05 very readily can move downwards to $1.62 or upwards to $2.28. The shape of the building can also change the picture. The building used in this study was 50 ft. x 200 ft. in plan, 10 stories and basement in height. If the size were changed to 100 ft. x 100 ft., 10 stories and basement, still providing the same gross floor area, there would be a reduction in the $2.05 cost of about 5%, or $0.10 per cubic foot.

As can be seen, any chart of building costs must be used with judgment, giving careful consideration to all factors involved.

Where the Research Laboratory Dollar Goes

Building and Cost Analysis by Turner Construction Co., New York, N.Y.

Owner	United Aircraft Corp.	General Dynamics Corp.	Carrier Corp.	Radio Corp. of America	International Business Machines Corp.	International Business Machines Corp.
Type of Building	Turbine Lab & Test Chambers	Engr Research Center & Testing Facilities	Admin & Research Center Air Conditioning	Electronics Research Center	Electronic Time & Labor-saving Devices Research Center	Engr & Develop Data Processing Machines Laboratory
Type of Construction	Windowless			a		
Location of building, city	E. Hartford, Conn.	Groton, Conn.	Syracuse, N. Y.	Philadelphia area	Poughkeepsie, N. Y.	Poughkeepsie, N. Y.
Height, stories		1+2	1	2+ph	3+ph	2
Floor area, sq. ft	167,500	43,512	195,790	325,760	188,789	98,920
Volume, cu ft	3,723,200	532,900	2,719,400	4,009,900	2,888,813	1,071,250
	———	———	—% of Total Cost—	———	———	———
Principal Items of Cost	%	%	%	%	%	%
Excavation, Site Improvements, Foundations	16.20	6.58	12.49	8.57	14.51	12.14
Structural Frame	38.29	12.20	10.79	16.57	9.51	8.31
Cement Finish Work	1.14	1.10	1.55	1.54	1.28	0.50
Exterior Masonry	10.32	7.82	5.00	4.34	4.15	
Interior Partitions	0.76	5.87	4.83	5.74	7.16	7.83
Carpentry and Millwork	0.40	0.62	2.51	1.54	1.13	1.55
Sash and Glazing	0.07	0.74	S1.36 G0.39	S0.78 G1.06	S0.87 G0.24	S9.73 G1.00
Roofing, Sheet Metal, Insulation	0.79	1.81	1.99	3.60	1.20	1.12
Waterproofing and Dampproofing	0.37	0.07	0.10		0.07	0.01
Metal Lath, Furring, and Plastering		3.72	1.65	0.78	1.25	0.67
Hollow Metal Work		0.92	0.67	0.51	0.46	0.35
Miscellaneous Iron and Ornamental Metal	8.15	1.49	5.35	11.40	5.30	2.62
Tile, Terrazzo, and Marble		1.83	1.56		0.45	0.63
Floor Covering		0.85	0.62	1.40	0.66	1.25
Painting and Decorating	1.50	1.23	0.90	1.17	0.65	0.60
Finish Hardware	0.09	0.33	0.41	0.54	0.17	0.17
Acoustical Treatment	4.47	3.05	2.02	2.66	1.16	2.34
Doors, Spec	2.21 OH,F,SP	0.64	0.32	0.14	0.38	0.32
Kitchen Equipment			1.69		2.46	
Plumbing	4.44	7.17	5.13	8.59	6.49	3.26
Heating, Ventilating, and Air Conditioning	6.17	14.92	15.49	15.58	23.35	23.94
Electrical Work and Light Fixtures	0.75	20.43	17.01	10.29	14.10	17.72
Elevators, Dumbwaiters, Conveyors, Hyd Lift	0.55	2.24	0.73	1.04	1.35	0.58
Incidental Items	0.14	2.05	2.04	0.33	0.32	0.88
Slab on ground	0.69	2.32	1.38	1.01	0.76	1.14
Sprinkler System	2.50		2.02	0.82	0.57	1.25
Process Piping						
Laboratory Equipment						

Owner	Portland Cement Assn.	Johns Manville Corp.	Socony Mobil Oil Co., Inc.	Sloan, Kettering Institute for Cancer Research	Massachusetts General Hospital	Colgate-Palmolive Co.
Type of Building	Cement & Concrete Research Laboratory	Insulation & Fire Resistance Research Center & Pilot Plants	Oil & Oil Prod Research & Develop Laboratory	Research Center Cause & Cure of Cancer	Research Building Diseases of Aging	Research Lab & Pilot Plant Dev of new Prod
Type of Construction	b				c	
Location of Building, city	Skokie, Ill.	Manville, N. J.	Paulsboro, N. J.	New York, N. Y.	Boston, Mass.	Jersey City, N. J.
Height, stories	1-2-3-4	2-3-4	2	13+ph	6+ph	5
Floor area, sq ft	101,318	114,290	68,525	145,190	57,700	73,932
Volume, cu ft	1,398,110	1,569,800	837,100	1,844,950	862,520	875,760
	———	———	—% of Total Cost—	———	———	———
Principal Items of Cost	%	%	%	%	%	%
Excavation, Site Improvements, Foundations	14.20	4.64	4.05	9.99	3.81	17.21
Structural Frame	12.83	10.46	11.60	15.03	10.53	30.70
Cement Finish Work	1.96	0.87	0.63	0.83	0.66	0.90
Exterior Masonry	14.15 conc	6.63	4.02	6.53	5.47	6.63
Interior Partitions	4.95	18.56	6.25	3.94	5.09	2.52
Carpentry and Millwork	0.93	0.16	0.40	1.75	2.92	0.15
Sash and Glazing	4.16	1.27	2.84	1.82	4.82	1.91
Roofing, Sheet Metal, Insulation	3.01	2.10	1.23	1.27	0.86	0.81
Waterproofing and Dampproofing	0.28	0.25	0.85	0.28	0.85	0.62
Metal Lath, Furring, and Plastering	0.14		0.96	1.88	0.64	0.40
Hollow Metal Work	1.01	0.52	2.89	1.93	0.56	0.96
Miscellaneous Iron and Ornamental Metal	3.85	2.88	2.47	3.18	2.70	4.02
Tile, Terrazzo, and Marble	0.88		3.58	0.67	0.48	2.24
Floor Covering	0.51	1.43	0.26	0.51	0.32	0.39
Painting and Decorating	0.35	0.46	0.78	2.01	1.34	1.66
Finish Hardware	0.37	0.56	1.33	0.69	0.57	0.31
Acoustical Treatment	0.72	4.06	0.45		0.53	0.79
Doors, Spec	0.27 OH		2.99 E&OH			
Kitchen Equipment		1.57				
Plumbing		7.24	4.59	13.21	10.63	7.02
Heating, Ventilating, and Air Conditioning	25.55	22.41	4.59	15.59	18.31	6.00
Electrical Work and Light Fixtures	8.00	11.27	12.62	11.19	8.75	9.55
Elevators, Dumbwaiters, Conveyors, Hyd Lift		1.79	0.80	4.67	3.61	2.81 Hyd Lft
Incidental Items	0.15	0.78	0.54	0.96	1.04	0.75
Slab on ground	1.73					
Sprinkler System		0.09		0.17	0.33	1.65
Process Piping			29.28			
Laboratory Equipment				1.90	15.18	

* Doors: Oh overhead F folding SP sound proof E entrance

a lift-slab, prefab exterior panels, five inter-connected buildings

b archt-concrete, two buildings, covered connecting walk

c adjacent to and connected to hospital

Where the Industrial & Service Building Dollar Goes

Ratio and Unit Cost Analyses by Courtesy of The Gillmore-Olson Co., Cleveland, Ohio, Burns & Roe, Inc., New York, Utah Construction Co., San Francisco, Calif., United Engineers & Constructors, Inc., Philadelphia, Pa., John W. Cowper Co., Inc., Buffalo, N. Y.

TYPE OF: Building:	Low Cost Mfg Casting, Assemb Plastics	Warehouse Asbestos Sheets	Branch Office Sales, Photo proc Warehouse, Repairs	Food Process	Chemical Mfg Bldg	Chemical Mfg Bldg	Steel Mill Building	Engineering Development Laboratory	Parking Garage 611 Cars	Power Generating Station	Power Plant Extension
Construction: frame	Steel	Steel, Timb Jst & Prin	Steel Frame	Steel	Steel	Steel	Steel	Steel	Concrete	Steel	Steel
outside walls:	Concrete block	Brick	Brick	Concrete Tilt Up	Asbestos	Asbestos	Metal	Brick	Open with some Masonry	Brick	Concrete and Brick
Date construction started	June 4, 1956	Aug. 6, 1956	March 25, 1956	May, 1955	September, 1954	June, 1956	October, 1956	April, 1952	July, 1954	June, 1951	1955
Location, city	Glendale, W. Va.	Cleveland, Ohio	Cleveland, Ohio	Central California	St. Louis, Mo.	Quebec, Canada	Ashland, Ky.	Philadelphia, Pa.	Buffalo, N. Y.	Philadelphia, Pa.	New Jersey
SIZE OF BUILDING:											
Height, stories	One–14′ clear	14′ clear–2 st	One Story–14′ clear	One story	2 Story	Varies	One Story	4 Story	4 Levels		160 ft (less stacks)
Floor area, sq ft	112,000 sf	16,680 sf	19,180 sf	567,000 sf	19,600 sf	sf	68,500 sf	57,000 sf	152,148 sf	.... sf	131,500 kw
Volume, cu ft	1,865,000 cf	198,100 cf	306,000 cf	14,175,000 cf	518,000 cf	4,100,000 cf	3,175,000 cf	1,145,000 cf	2,193,704 cf	6,413,000 cf	2,800,000 cf
% Air conditioned	One %	0%	56%	60%	....%	....%	....%	25%	....%	....%	5%
RANGE of COST of this type of building	Actual	Actual	Actual	Actual	Min / Aver / Max	Min / Aver / Max	Min / Aver / Max	Min / Aver / Max	Actual	Min / Aver / Max	Actual
Cost, $ per sq ft	$6.01	$6.82	$10.90	$7.06	$22.00 / $25.00 / $28.00	.... / .... /	$9.00 / $10.00 / $11.00	$20.00 / $22.00 / $25.00	$6.64		
Cost, $ per cu ft	$0.26	$0.57	0.68	0.282	$0.85 / $0.95 / $1.20	$0.60 / $0.65 / $0.70	$0.20 / $0.21 / $0.23	$1.00 / $1.50 / $2.00	$0.334	$1.00 / $1.05 / $1.10	$0.78
Cost $ per unit of capacity	....	....	....	....	.... / .... /	.... / .... /	.... / .... /	.... / .... /	$1200/stall	.... / .... /	$131/kw
ENR BUILDING COST INDEX	489	491	483	463	454	489	500	408	444	401	469
	Percent of Total Cost										
PRINCIPAL ITEMS OF COST	%	%	%	%	%	%	%	%	%	%	%
Excavation and Site	3.68	5.37	4.18	6.5	0.59	1.58	2.80		3.80	3.64	3.40
Foundations	10.81	12.76 d	7.76	3.1	16.95	12.30	19.12	19.83	30.59	13.15	2.20
Structural Frame	15.66	18.07	7.14	12.2	29.60 Steel	40.44 Steel	38.00	18.32	52.63	38.45 o	4.37
Cement Finish Work	11.50 a	2.12 e	1.35	9.9	10.65 Conc	6.34 Conc	....		....	....	incl in Floors
Exterior Masonry	4.00	25.11	11.07	0.9	1.77	....	....	14.33 m	2.02	7.80	1.37
Metal Wall Panels	....	....	1.02	....	....	....	6.26	....	....	0.63	....
Interior Partitions	2.07	....	7.24	0.5	0.76	1.26	....	0.91 Steel	1.50	....	0.57
Carpentry and Millwork	0.33	7.67	3.40	....	....	....	....	....	0.01	....	....
Sash and Glazing	1.17	0.49	1.28	....	1.59	1.36	....	1.61	0.02	0.65	....
Doors	0.74	1.61	1.30	1.5	.72	1.16	0.92	1.38	....	1.30	0.26
Roofing	11.01 b	6.38	5.84	12.3	4.78 h	2.50	12.21 j	1.85 n	0.01	1.32	0.23
Insulation	....	....	....	1.6	3.91 i	6.22 i	....	....	....	....	incl in Roof
Water- & Dampproofing	0.01	....	0.40	....	....	....	....	....	0.01	....	incl in Fdn
Metal Lath, Furring, Plaster	....	....	1.54	1.9	....	....	....	0.09	....	....	....
Hollow Metal Work	0.13	0.27	0.27	....	....	....	0.33	....	0.02	0.07	incl in Doors
Misc Iron & Ornamental Metal	0.24	....	0.56	0.2	3.68	3.98	0.71	1.97	1.62	11.92	incl in Frame
Tile, Terrazzo, and Marble	....	....	2.38	0.3	....	....	....	0.06	0.01	0.66	....
Floor Covering	0.07	....	0.57	0.1	....	....	....	0.35	....	....	1.37
Painting	3.05	0.98	2.40	1.8	1.07	1.35	2.01	1.29	0.03	3.74	0.04 p
Finish Hardware	0.15	0.22	0.53	....	....	....	....	2.37	0.01	....	incl in Doors
Acoustical Ceilings	0.13	....	1.76	....	....	....	....	3.31	....	0.18	....
Plumbing	2.95	8.57	5.02	....	3.54	4.05	2.68	13.97	....	6.14	0.36 & Drains
Heat, Vent, & Air Condition	6.65	....	14.60	26.7	6.06	6.92	6.78	16.02	....	3.93	0.40
Electr Work & Light Fixtures	11.19	3.78	10.09	7.7	8.96	6.10	5.33	1.39	....	5.35	0.71 q
Elevators	....	....	....	....	....	....	....	....	....	1.07	0.18 Cum 12.06
Moving Stairs	....	....	....	....	....	....	....	....	....	....	....
Spec Service Equip: Cranes, Conveyors	....	2.42	....	r	s	ss	t	....	u	....	....
Power Plant	....	....	....	2.6 g	....	....	....	....	....	....	....
Production Equip: mach tools, process equip, etc	0.46 c	....	....	....	....	....	....	....	....	....	....
Sprinklers	10.62	....	3.38	....	....	....	....	0.95	....	....	....
Engineering, design, estimating	3.38	4.18	4.62	....	....	....	....	....	....	....	....
Bridges	....	....	....	2.1	....	....	....	....	....	....	....
Refrigeration, Plant	....	....	....	1.2	....	....	....	....	....	....	....
Room	....	....	....	2.2	....	....	....	....	....	....	....
Spur Tracks	....	....	....	1.5	....	....	....	....	....	....	....
Cooling Tower	....	....	....	1.0	....	....	....	....	....	....	....

Boiler Plant Equipment	46.00
Turbo-Generator Units	28.20
Accessory Electric Equipment	6.22
Misc. Power Plant Equipment	1.15 Cum 81.57
Station Equipment	1.87
Coal Bunker, incl venting	0.72 Cum 2.59
Stack	0.13
Fire Protection System	0.25

a Incl all conc floor
b Incl roof deck & insulation
c Install only, equipment bought by owner
d Incl ground floor & paving
e Rubbing & finishing
f Land not avail for 1-st warehouse
g Steam PP
h Incl precast conc roof deck
i Asbestos siding
j Incl steel roof deck
k Incl all conc work
m Incl interior masonry partitions
n Incl gypsum roof deck
o Incl superstruct cement
p Architectural painting
q Incl small power
r Tunnel & Pits 2.2%
s Acid Brick & Mastic Floors 5.37% & ss 4.44%
t Wood Block Floor 2.85%
u Demolition 7.72%

Where The Building Dollar Goes

Unit and Ratio Costs Supplied through the Courtesy of J. F. Holley Construction Co., Inc., Birmingham, Ala., A. F. Peaslee, Inc., Hartford, Conn., John W. Cowper Co., Inc., Buffalo, N. Y., Walter Nashert Co., Oklahoma City, Okla., John W. Daniel & Co., Inc., Danville, Va., Psaty & Fuhrman, Inc., New York, N. Y.

TYPE OF: Building (purpose or product)	Office Bldg	Grade School	School	School	School		Seminary (Board-School)	Dormitory	College Library		Hospital	Hospital	
Construction: frame	Steel	Steel	Steel	Steel	Steel & Concrete		Conc & Steel Frame	Steel	Concrete Frame		Concrete Frame	Steel & Concrete	
outside walls	Brick & Stone	Brick & Cinder-Block	Brick	Brick & Block	Brick & Metal		Brick	Brick & Block	Brick & Limestone		Stucco on Struct Tile	Brick	
Date construction started	July, 1956	April, 1956	Nov. 1955	1957	March, 1956		Feb. 1957	June, 1957	Nov. 6, 1955–April, 1957		July, 1956	September, 1955	
Location, city	Buffalo, N. Y.	Hartford, Conn.	Salamanca, N. Y.	Chesterfield County, Va	Long Island, N. Y.		Oklahoma City, Okla.	Petersburg, Va.	Birmingham, Ala.		Oklahoma City, Okla.	New York, N. Y.	
SIZE OF BUILDING: Height, stories	7	2	1	2	1 & 2		2 & B	3	3		5 & B	9	
Floor area, sq ft	142,000 sf	68,000 sf	146,415 sf	24,600 sf	372,600 sf		113,091 sf	35,500 sf	60,716 sf		40,266 sf	155,282 sf	
Volume, cu ft	1,890,000 cf	1,000,000 cf	2,352,879 cf	...... cf	5,909,400 cf		1,433,186 cf	...... cf	...... cf		382,527 cf	1,992,275 cf	
% air conditioned	.... %	.... %	Auditorium Only %	...... %	.... %		10%	...... %	...... %		100%	.... %	
RANGE of COST of this type of building	Min Aver Max	Min Aver Max	Min Aver Max	Min Aver Max	Actual		Actual	Min Aver Max	Actual		Min Actual	Max	Actual
Cost, $ per sq ft	$17.00 $19.25 $22.00	$10.00 $17.00 $24.00	$10.37 $12.15 $13.55	$18.25 $18.50 $18.75	$19.40		$16.21	$14.41 $14.90 $15.38	$13.63		$23.00 $24.88	$30.00	$28.80
Cost, $ per cu ft	$ 1.06 $ 1.20 $ 1.37	Total $1,150,000	$ 0.63 $ 0.787 $ 0.904	....	$ 1.22		1.21	....	.....		..... 2.40	.....	$ 2.25
Cost, $ per unit of capacity	....	....	$1598/p $1873/p $2088/p 950 Pupils	....	$2779/p Total $7,224,656		.....	....	.....		..... $10,891/bed	.....	$15,819/bed Total $4 476,700
ENR BUILDING COST INDEX	489	486	479	502	483		503	504	501		489	479	
					Percent of Total Cost								
PRINCIPAL ITEMS OF COST	%	%	%	%		%	%	%		%	%		%
Excavation & Site	1.60	6	3.15	20.6	$378,774	5.25	2	0.4	$5,784	0.79	2	$159,000	3.55
Foundations	4.65	5	10.73	6.1	620,000	8.60	27.5	3.7	16,730	2.28	16	392,000	8.75
Structural Frame	21.13	12	22.57	6.9	885,000	12.25		13.0	91,335	12.42 i		720,200	16.08
Cement Finish Work	....	5		4.1	233,300	3.23		4.8	3,452	0.47		53,000	1.18
Exterior Masonry	4.04	5	8.44	6.6	826,500	....	Incl in Ext Mas	8.8	194,378	26.43 j	9	254,800	5.69
Metal Wall Panels	....	5		....	208,000	2.87 d	23.5	....	......	....		......	....
Interior Partitions	4.21	....	9.27	5.5	Incl with Ext Mas		....	5.8	31,760	4.32	Incl with Ext Mas	233,580	5.21
Carpentry & Millwork	8.45	5	8.91	4.0	394,900	5.47	3.5	11.6	78,471	10.67 k	3	47,000	1.05
Sash & Glazing	0.87	7	3.62	1.8 & Mirrors	40,000	0.55	Incl with Doors	0.2	7,118	0.97 m	2	145,500	3.25
Doors	....	In Millwork	....	In Millwork	In Mil & Hol Met		5.25 f	In Millwork	......	....	....	In Millwork & Hol Met	
Roofing	0.54	2	5.18	4.3 & Deck	137,500	1.90 e	1	5.0 & Deck	29,399	4.00	2	36,000	0.80 e
Insulation	....	In Roofing	....	In Roofing	......	....		In Roofing	......	....	0.25	500	0.11
Water- & Dampproofing	....	....	....	0.5	31,500	0.44		2.2	1,200	0.16	....	41,000	0.91
Metal Lath, Furring, & Plastering	5.67	5	4.30	4.3	36,000	0.50	3.5	7.4	7,599	1.03	5.75	89,000	1.98
Hollow Metal Work	6.21	0.5	4.06	0.3	93,000	1.27	....	0.9	4,708	0.64	....	28,000	0.62
Misc Iron & Ornament Metal	0.94	3.5	1.88	0.4	241,000	3.34	....	In Structural	17,733	2.41	....	130,000	2.90
Tile, Terrazzo, & Marble	2.52	1	7.25	3.0	195,000	2.70	3	5.4	14,029	1.91	4	216,700	4.84
Floor Covering	1.01	1.5	0.06	2.0	63,500	0.88	1	1.8	5,791	0.79 n	3	39,000	0.87
Painting	0.82	2.5	2.58	1.3	65,000	0.90	1.5	3.2	7,825	1.06	2	36,270	0.80
Finish Hardware	0.70	1.5	1.77	0.7	53,000	0.73	2	1.8	4,972	0.68	2.5	42,000	0.93
Acoustical Ceilings	2.51	1.5	3.90	In Floor Cov	150,000	2.08	0.25	In Floor Cov	14,556	1.98	0.5	70,000	1.56
Plumbing	4.59	5	 c	18.6	449,000	6.22 c	Incl with Heating	15.9	Incl in Heating		Incl with Heating	434,000	9.70
Heat, Ventil, & Air Conditioning	2.81 a	10	 c	In Plumbing	806,482	11.17 c	13.5	In Plumbing	116,187	15.80	28.5	361,400	8.07
Electrical Work & Light Fixtures	13.44	8	 c	7.0	952,000	13.18 c	8	5.3	79,515	10.81	11	534,800	11.93
Elevators	8.24	....	0.56 b	....	16,000	0.22 e	0.75	2.2	2,806	0.38	3.5	231,930	5.18
Moving Stairs	.....	....	....	....	......	....	....	....	......	....	....	......	....
Equip: kitchen, operatg rm, gym, stage, etc	1.47	3	1.77	....	349,200	4.82	2.25 g	0.6 h	......	....	....	181,020	4.04
Underpinning	3.58	....	....	....	......	....	....	....	......	....	....	......	....
General conditions	.....	5	....	....	......	....	....	....	......	....	....	......	....
Home Econ & Art Room Equip	.....	....	....	2.0	......	....	....	....	......	....	....	......	....
Metal Specialties	.....	....	....	....	......	....	1.5	....	......	....	5 o	......	....

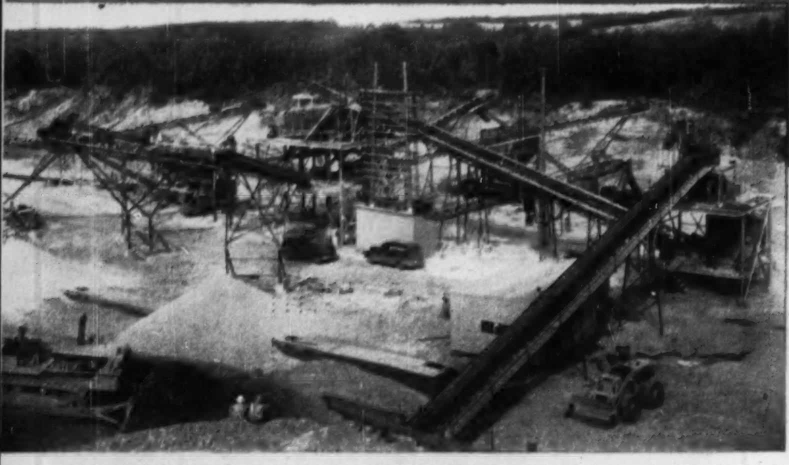
a Existing Heating Plant Used
b Hoist & Truck Lift
c Separate Contracts Let by Owner
d Incl Aluminum Windows
e Incl Sheet Metal
f Metal Doors
g Kitchen Equipment
h Kitchen Cabinets
i Concrete
j Incl Limestone
k Incl Sash
m Glazing & Glass Only
n Asphalt Tile
o Also Casework & Shelving

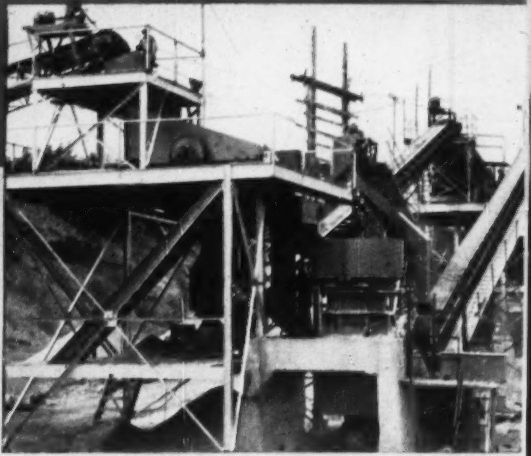
This sixth report in the series on "Where the Building Dollar Goes" continues to illuminate the complexities of building cost estimating and to illustrate the diversities in individual buildings. (For fifth report see ENR December 6, 1956, p. 208.)

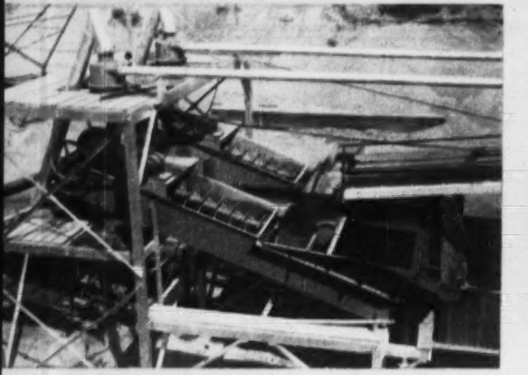
The high cost of site work, 20.6% in the Chesterfield County, Va. school is because it includes a clay and gravel track and roads in a subcontract in which the costs could not be separated. On the other buildings this item has varied from lows of zero and 0.4% to a high of 6.5%.

Since unit costs are given as well as the ratio costs, the values are shown for the ENGINEERING NEWS-RECORD Building Cost Index for the date on which construction was started. This offers a convenient means for adjusting the costs shown for cost changes since the building was built by updating with the appropriate index values.

DALES BROTHERS LTD., Onoway, Alberta • Telsmith 13-B Gyratory Primary Crusher and Telsmith 5' x 12' two-deck heavy-duty Scalper.

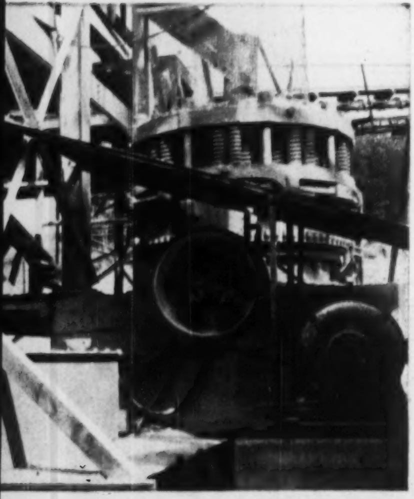






Two Telsmith 24" x 19' Twin Screw Classifiers and two 24" diam. DorrClones recover concrete sand.

Telsmith 48-FC Gyrasphere Secondary Crusher takes the oversize from the two-deck dry Scalper and the three-deck wet Vibro-King Screen.



G-29

designed and equipped
by
TELSMITH®

This completely modern and highly efficient aggregate plant at Onoway, Alberta, near Edmonton—designed and equipped by Telsmith Engineers in cooperation with the Dales brothers. It produces six sizes *simultaneously*—washed, natural concrete sand, with minus ¼" from crushing plant; ¾" x ¼", 1⅛" x ¾" natural gravel and ⅜" x ¼", 1⅛" x ¾" crushed gravel, all washed. Minus 1" road material, crushed, dry screened is also made. Pit runs 70% tough, abrasive gravel 8-10" minimum and 30% sand. Plant's average daily capacity is 250 cu. yds. hourly.

PLANT EQUIPMENT BY TELSMITH

36" x 6' Heavy Duty Plate Feeder • 13-B Gyratory Primary Crusher • 48-FC Gyrasphere Secondary Crusher • 72" x 22' Hercules Washing Screen • 5' x 12' Double Deck Heavy Duty Scalper • 5' x 14' Triple Deck Vibro-King Screen • Two 24" x 19' Twin Screw Sand Classifiers • Two 24" DorrClone Classifiers • Seventeen 20" x 18" Boquad Tunnel Gates.

Send for Telsmith Complete Plant Equipment Guide 266

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Air Conditioning Compared to Total Cost To Own and Operate Buildings

John E. Haines, Vice President, Minneapolis-Honeywell Regulator Co. At a Government-Industry Air Conditioning Symposium—1957

	Annual cost to Own & Operate $/sq ft						
	Hospital Patient Area		Industrial Building		Office Building		Officers Quarters
	New	Exist	New	Exist	New	Exist	
Building	$8.66	$8.30	$1.83	$1.29	$3.03	$2.68	$2.40
Equipment & Supplies	26.28	26.33	7.05	7.05	2.00	2.00	1.80
Salaries & Benefits	26.94	26.94	36.10	36.10	66.00	66.00	27.50
Air Conditioning:							
Incomplete System	1.02	1.10	0.42	0.50	0.46	0.55	.....
Complete System	1.16	1.26	0.47	0.58	0.53	0.65	0.51
Total/year, Incomplete System	$62.90	$62.67	$45.40	$44.94	$71.49	$71.23	.....
Complete System	63.04	62.83	45.45	45.02	71.56	71.33	$32.21
Estimated Efficiency Improvement Required in Personnel to Amortise Air Conditioning Cost in 20 years	4.3%	4.7%	1.3%	1.8%	0.95%	0.99%	1.9%

This analysis of what it costs to own and operate buildings was made through a nationwide study by Minneapolis-Honeywell Regulator Co., with the assistance of Carrier Corp., to find out how much of an improvement in productivity it would take to pay for air conditioning. In addition to this study, Mr. Haines cites separate studies of added productivity attributed to air conditioning that illustrate and support his thesis.

The basis for the annual costs shown in the table is: new buildings are based on 1957 construction costs, existing buildings at half of this. Insurance and taxes are estimated at 2% of original construction cost except for public buildings where 1% is used to cover insurance. Air conditioning cost is for central fan system with 20 year life with 5% of original cost added for interest and 2% added to cover insurance and taxes.

No heating costs are included under air conditioning and all outside walls are assumed. Where inside walls are used the cost is less.

Air conditioning used in this study meets the definition of the American Society of Heating and Air Conditioning Engineers.

It is the process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of the conditioned space.

"Complete" air conditioning as used here is a complete and flexible system that provides for each individual conditioned space:

- an adequate source of heating and cooling
- control of temperatures
- adequate humidification and dehumidification
- adequate removal of dirt, other air borne particles and odors
- introduction of sufficient outside air
- introduction and distribution of conditioned air at an acceptable noise level without drafts

An "incomplete" system is one that fails to meet any one or more of these requirements.

Studies of improved productivity attributed to air conditioning include:

Detroit Edison Company's drafting room efficiency went up 51% after air-conditioning was installed, from 5008 manhours on 8988 work units to 3872 manhours on 10,474 work units.

Federal government stenographers typed triangulation data in 1946 for two weeks in non-air conditioned space then were moved, with the same typewriters, to air conditioned space where a 2-week test showed productivity to be up 24%.

C. F. Braun & Co., oil refinery and chemical company, found a 35% increase in efficiency for 575 white collar workers when they moved into their new air conditioned building, but better light and improved space arrangement contributed also to this improvement.

John Hardy & Son, manufacturers of nylon hosiery in Pulaski, Tenn. found productivity up 29% after they installed air conditioning and in addition they found that maintenance costs on their knitting machines dropped 80%.

A survey of 75 manufacturing plants in the New York City area showed that an average of $108 per year in wages for each employee was lost per year in absenteeism. This dropped from 25% to 30% after air conditioning was installed, turnover was reduced and in addition cleaning costs were lower and employee productivity was higher.

Aluminum Co. of Canada experienced a drop in absenteeism and also in the rate of turnover after rest rooms were air conditioned.

Elgin National Watch Co. found that rework decreased 25% after they put in air conditioning.

With an annual cost of $26.94 per sq ft to $66.00 for salaries and benefits of personnel Mr. Haines concludes that it would take an improvement of only 0.95 to 4.7% to amortize the cost of a complete air conditioning installation.

Tennessee Cites Low Costs To Attract New Industry

The Tennessee Industrial & Agricultural Development Comm, Nashville, by enlisting the aid of contractors, is quoting the low cost of industrial building as one of the good reasons why industry should come to Tennessee.

Allen Bros. Construction Co., Memphis, for example, in January, 1957 quoted $3.20-$3.75 psf without air conditioning, $3.35-$3.90 with office air conditioned and $4.40-$9.00 psf with complete air conditioning for a standard 100,000 sq ft building of masonry or precast concrete wall construction, bar joist and beam roof framing, steel roof deck, minimum clear height of 14 ft under joist, built-up tar and gravel roof over rigid insulation, reinforced concrete floor, average factory heating, lighting, plumbing and office finish.

Foster & Creighton Co., Nashville, on a one-story building of the same size, concrete block walls with brick veneer in front, sprinklered throughout, overhead gas heaters, insulated roof deck, in January 1957 estimated the cost at $3.25-$3.75 without air conditioning, $3.40-$3.90 with a 10,000 sq ft office air conditioned and $4.50-$5.00 psf with air conditioning throughout.

The Knoxville Chapter, Associated General Contractors of America, Inc., consulted members and offered these representative costs: without air conditioning $3.75 psf, with 10,000 sq ft office air conditioned $4.25 and with complete air conditioning $5.00 psf.

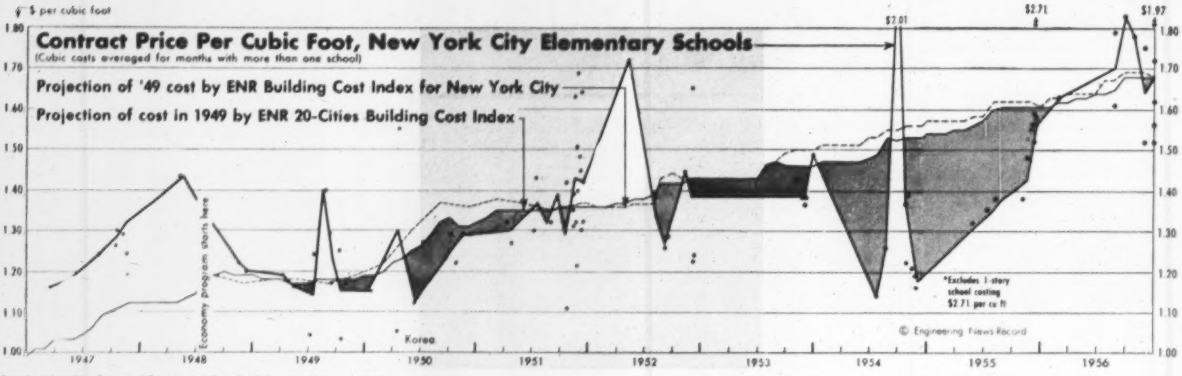
The Chattanooga Chapter, AGC, quotes $3.50 psf plus $1.25-$1.50 psf for air conditioning depending on the area.

No land costs are included. All prices would be subject to the requirements of individual building plans.

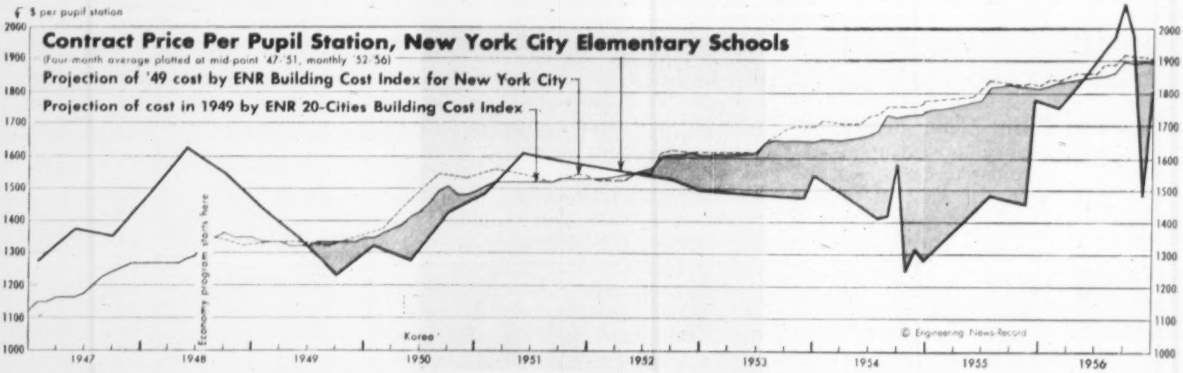
Metal Buildings Company, Inc., Memphis, estimates the cost of construction of a new Stran-Steel, rigid frame, all steel building with new panel sheets to be: $2.50-$2.75 psf for basic building, nominal doors and windows, 80 ft rigid frame spans, 20 ft bay spacing, 14 ft sidewalls, delivered and erected including footings, foundations and 4 in. reinforced concrete floor, 2,500 psi. These prices apply to buildings 30,000 to 100,000 sq ft in size.

Add to this base price range: for insulation 25-30¢ psf for 1 in. glass fiber with aluminum foil vapor barrier, U factor 0.15 and for utilities.

10-15¢ psf factory type plumbing, including rest room for office.
10-20¢ psf wiring, standard warehouse.
30-35¢ psf sprinkler system.
10-12¢ psf office, 10% of total floor space, air conditioned.
$1.00-1.15 psf air conditioning entire plant.
59-60¢ psf wiring, lighting for garment plant.
0.05-0.06¢ psf heating warehouse.
0.03-0.04¢ psf painting outside of building.



Based on data from Bureau of Construction, Board of Education, New York, N.Y.



Unit Prices of Schools Built in New York City—by Years

Elementary Schools

		per cu ft			per pupil sta			capacity, pupil stas		
	no	min	aver	max	min	aver	max	min	aver	max
1947	(9)	$1.16	$1.25	$1.56	$1,255	$1,517	$1,991	558	1,162	1,550
1948	(5)	1.20	1.30	1.43	1,399	1,581	1,784	806	1,094	1,433
1949	(12)	1.03	1.18	1.40	1,148	1,334	1,638	868	1,181	1,588
1950	(11)	1.04	1.20	1.55	957	1,357	1,612	302	1,036	1,581
1951	(24)	1.11	1.39	1.69	1,447	1,710	2,451	358	885	1,274
1952	(9)	1.23	1.40	1.72	1,391	1,518	1,689	494	969	1,310
1953	(6)	1.37	1.41	1.49	1,202	1,488	1,570	792	944	1,238
1954	(9)	1.14	1.33	2.01	1,216	1,354	1,580	302	1,073	1,292
1955	(10)	1.35	1.61	2.71	1,338	1,653	2,059	133	1,117	1,364
1956	(12)	1.52	1.69	1.97	1,467	1,811	2,361	842	1,244	1,631

Junior High Schools

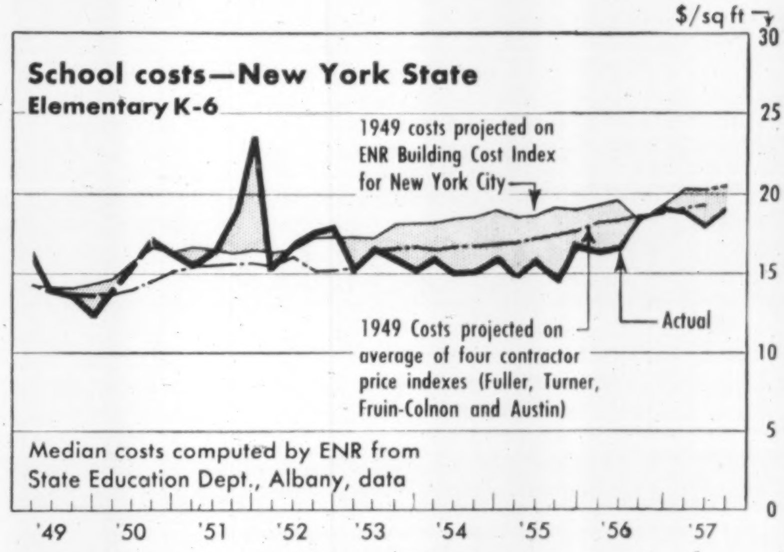
		per cu ft			per pupil sta			capacity, pupil stas		
	no	min	aver	max	min	aver	max	min	aver	max
1947	(2)	$1.21	$1.23	$1.25	$1,270	$1,277	$1,284	1,810	2,068	2,326
1948	(1)	1.32	1.32	1.32	1,623	1,623	1,623	1,518	1,518	1,518
1949	(3)	0.99	1.09	1.26	1,261	1,380	1,553	1,518	1,819	1,998
1950	(1)	1.07	1.07	1.07	1,210	1,210	1,210	2,012	2,012	2,012
1951	(5)	1.32	1.36	1.38	1,408	1,511	1,645	1,558	1,842	2,020
1952	(7)	1.10	1.22	1.31	1,187	1,342	1,451	1,732	1,813	2,056
1953	(7)	1.10	1.22	1.29	1,176	1,280	1,462	1,766	1,968	2,185
1954	(6)	1.10	1.23	1.30	1,237	1,322	1,517	1,694	1,969	2,136
1955	(11)	1.25	1.44	1.63	1,370	1,580	1,904	1,772	1,950	2,114
1956	(6)	1.49	1.64	2.02	1,580	1,711	1,895	1,764	1,959	2,166

School Building Contract Unit Prices, New York City—1956

Bureau of Construction, Board of Education, City of New York

			Min-aver-max COST per		Min-aver-max % of total bldg contract price*			
No.	Size, min aver-max pupil station	Large units	pupil station	cubic foot	general constr %	heating %	plumbing %	electrical %
Elementary, New 4-story								
3	1,300-1,412-1,631	Aud; gym; lunch-playrm	$1,607-1,706-1,760	$1.62-1.74-1.97	72.6-74.1-75.1	9.2-10.6-11.7	5.5-6.1-6.8	8.9-9.2-9.6
Elementary, New 3-Story								
8	1,027-1,231-1,533	Aud; gym; lunch-playrm	1,467-1,781-2,072	1.52-1.68-1.83	72.0-74.2-75.2	8.7-10.0-12.0	6.0-7.0-8.2	8.0-8.9-9.9
Elementary, New 2-Story								
1	842	Aud; gym; lunch-playrm	2,361	1.61	74.8	10.2	5.9	9.1
Elementary, Addition								
Three-story, incl 12 classrooms			961	1.77	81.0	9.9	4.3	4.8
Two-story, incl 10 classrooms			1,568	2.35	78.6	8.3	7.1	6.1
One-story (3rd fl), incl 8 clrms			1,099	2.08	78.8	11.5	4.0	5.8
Junior High, New 4-Story								
1	2,095	Aud; gym; caf	1,580	1.51	74.4	10.2	5.3	10.1
1 Comb school & recreation center	2,076	Aud; gym; caf	1,582#	2.02# 1.29†	69.5#	11.6#	8.0#	10.9#
Junior High, New 3-Story								
4	1,764-1,895-2,166	Aud; gym; caf	1,720-1,776-1,895	1.49-1.58-1.65	72.9-74.2-75.4	9.9-10.7-11.6	5.1-5.5-5.9	8.8-9.6-10.2
Junior High, Addition, 5-Story								
1	(large units only)	Gym; caf; aud extension	.....	2.23	73.7	9.7	7.1	9.5
1	(9 cl rms, 1 shop)	Gym; aud	.....	1.68	74.3	8.9	8.0	8.8
High Schools, New								
Fashion Inst, 10-story	2,070	Aud; gym; restaurant	4,091	2.12	73.9	7.9	4.6	13.6
Science, 4-story	3,677	Aud; gyms (2); caf	1,771	1.65	65.7	10.8	7.0	16.5
Vocational, 3-story	2,393	Aud; gym; caf	2,309	1.79	67.3	9.9	7.6	15.2

* Excludes abnormal site costs # Excludes recreation center cost † Including recreation center and swimming pool



School Cost Rise Halts

Costs of new elementary K-6 schools in New York State appeared to halt their 18 month rise which began in the third quarter of '55 and carried through the fourth quarter of '56 (see chart).

The median cost of 14 of these schools let in the second quarter of this year was $18.30 per sq ft, according to the projects reported by the Division of School Buildings and Grounds, State Education Department. This was below the recent high of $19.25 per sq ft in the fourth quarter of last year. Although the few projects let in the third quarter show an increase over the second quarter, the preliminary median of $19.35 per sq ft is still below the late '56 median cost.

Of the 14 elementary schools awarded in the second quarter, the ten projects with two large units (auditorium, gym, lunch-playroom or other type) had a median cost of $18.10 per sq ft. This was the lowest cost since the second quarter of last year and was well under the high $19.23 in the first quarter.

Costs of secondary schools in New York State show a similar trend. The median cost for five projects awarded in the second quarter was $18.30 per sq ft.

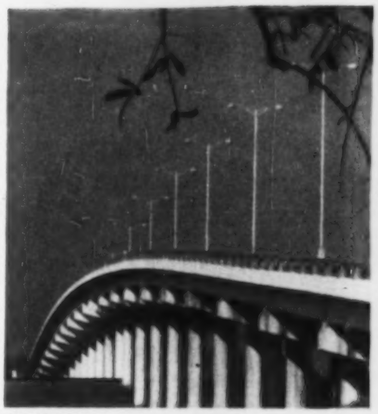
Despite the halt in the uptrend of costs for elementary and secondary schools this year, second quarter costs were substantially higher than in the first six months of 1956. Even so, it is apparent that New York taxpayers are getting their money's worth when buying new schools in 1957. This is because the median cost of new schools has not risen as rapidly as basic costs of construction materials and labor, as measured by the ENR Building Cost Index (chart). Neither have actual median costs risen as much as contractor selling prices. In fact, there has been a marked widening of the gap between actual contract costs and the ENR and contractor selling price indexes.

School Costs Per Square Foot in New York State

State Education Department, Division of School Buildings and Grounds

	No. of Schools K-6 Total	Elementary, K-6 Dollars per sq ft for schools with . . . One Large Unit* Min			Two Large Units* Min			Three Large Units* Min			No. of Schools 7-12 Total	Secondary, 7-12 Dollars per sq ft Min		
		Min	Med	Max	Min	Med	Max	Min	Med	Max		Min	Med	Max
1949	29	$10.40	$14.00	$19.20	$12.00	$14.60	$18.70	.....	.....	.....	4	$13.20	$13.55	$16.20
1950	20	10.85	17.00	20.80	13.75	16.66	17.80	.....	.....	.....	4	13.35	13.70	14.40
1951	59	12.30	16.45	25.40	18.70	20.25	22.60	$13.90	$23.60	$29.20	6	15.40	16.97	19.30
1952	57	11.40	16.30	20.20	13.00	17.60	21.10	14.20	18.20	23.30	7	15.00	17.10	19.90
1953	65	10.20	16.05	23.40	13.60	16.15	19.40	11.30	16.30	18.80	12	14.15	16.00	18.80
1954	70	10.00	14.55	20.80	12.80	16.05	21.80	14.80	15.30	18.40	17	13.70	15.60	18.00
1955	52	11.75	16.40	23.60	11.90	15.70	20.25	14.90	14.90	15.90	13	12.55	17.10	18.50
'56, Q1	11	14.95	15.10	18.40	14.45	16.80	18.50	.....	.....	.....	2	16.75	18.83	20.90
Q2	18	14.40	16.50	18.55	14.60	18.00	19.00	.....	17.10	.....	2	15.80	16.98	18.15
Q3	9	12.90	19.10	21.60	14.15	18.50	21.10	.....	16.50	.....	2	15.40	17.25	19.10
Q4	15	16.00	20.70	23.80	13.25	18.85	21.00	.....	.....	.....	1	.....	18.60	.....
'57, Q1	11	17.80	18.58	19.35	15.70†	19.23	21.75	.....	18.70	.....	1	.....	18.51	.....
Q2	14	14.65	19.60	25.20	12.90	18.10	19.15	.....	.....	.....	5	17.00	18.30	20.00
Q3	3	.....	17.80	.....	19.15	19.28	19.40	.....	.....	.....	.....	.....	.....	.....

* Large Unit includes a general purpose room, gymnasium, auditorium, multi-purpose or other group activity room.
These are costs based on the four contracts—general construction, plumbing, electrical, heating and ventilating. They include built-in features, but no movable furniture or equipment. Some minor site improvement may be included, but no major site work and no land costs.



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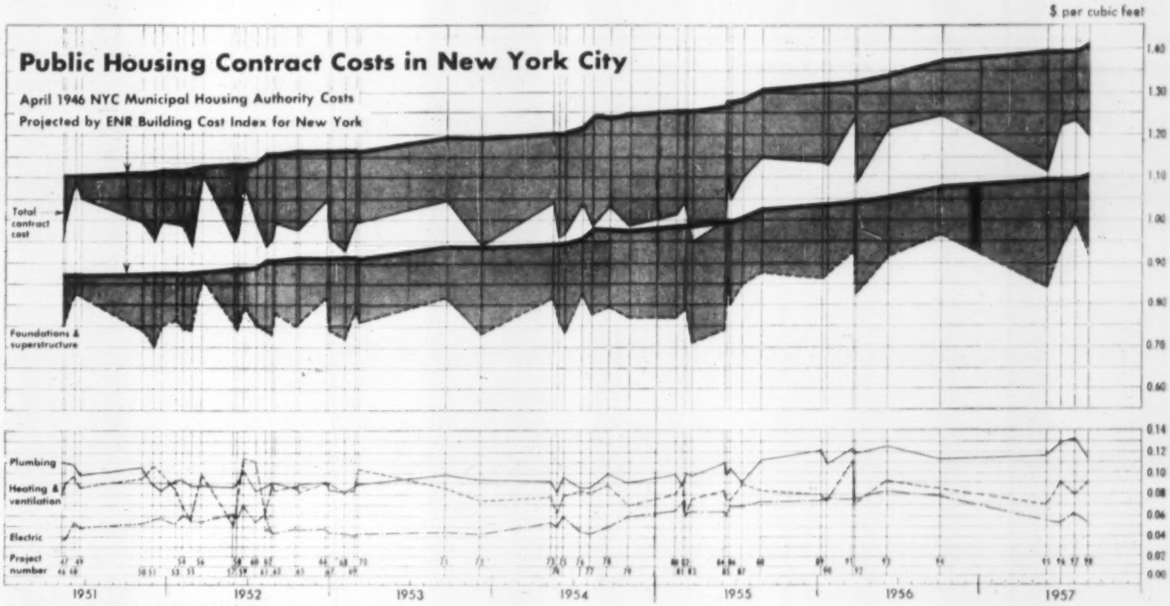


Public Housing Contract Costs in New York City

April 1946 NYC Municipal Housing Authority Costs
Projected by ENR Building Cost Index for New York

Data from New York City Municipal Housing Authority

New York Public Housing Costs Inch Up

Contract costs of public housing projects let in the first three quarters of 1957 inched slightly higher than in 1956, according to figures of the New York City Municipal Housing Authority.

For a total cubage of 43.7 million cu ft in four projects let in '57, the authority will pay some $51.3 million, or about $1.17 per cu ft. This is 1.7% more than the cubic foot cost of six projects awarded in all of 1956 at an average of $1.15 per cu ft based on nearly 48 million cu ft to cost nearly $55.2 million.

This increase is less than the year-to-year rise in ENR's Building Cost Index between September '56 and September '57. This index shows that materials and labor costs rose 3.0% in New York.

Thus even though contract prices are up a little, the Housing Authority is actually getting a better price than if contractors passed on the full amount of the rise in their costs as measured by the ENR index.

The rise in 1956-57 total contract costs is mainly, if not entirely, due to increased costs of foundations, superstructures and plumbing work. As the chart above shows, both of these categories of costs have run generally higher this year than last.

By contrast, bids on electrical work have definitely turned downward this year, thus offsetting part of the rise in other items in the contract. Heating and ventilation work shows little change from last year in cost per cubic foot.

Public Housing Contract Totals and Unit Prices—1956-57

Awards by New York City Housing Authority

		1st Quarter 1956			2nd Quarter 1956	4th Quarter 1956	Second Quarter 1957		Third Quarter 1957	
Project Number		(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)
Project		Millbrook Houses I*a*	St. Mary,s Park Houses *b*	Sumner Houses II*a*	Douglass Houses *a*	Wagner Houses II*c*	Millbrook Houses II*a*	Castle Hill Houses	Jefferson Houses III*c*	Baruch Houses III*c*	Louis Heaton Pink Houses
Total constructed rooms	No.	2,780	4,030	2,100	8,079	4,173	2,303	8,761	2,980	2,700	6,352
Total apartments	No.	690	1,007	514	1,999	985	565	2,025	700	658	1,500
Rooms per apartment	Av. No.	4.03	4.00	4.09	4.04	4.24	4.08	4.33	4.26	4.10	4.23
Total cubage	Cu. ft.	5,708,391	8,922,993	3,999,113	16,984,651	7,606,440	4,738,196	19,247,987	5,909,373	5,264,205	13,316,063
Bid date		1/11/56	1/24/56	3/20/56	3/23/56	6/5/56	10/2/56	5/7/57	6/28/57	7/23/57	8/27/57
Cost per:											
Total contract		$6,501,632	$10,099,528	$4,944,818	$18,484,620	$9,239,193	$5,883,183	$21,556,064	$7,303,408	$6,658,912	$15,815,250
Constructed room		2,338.72	2,506.09	2,354.68	2,287.98	2,214.04	2,554.57	2,460.46	2,450.81	2,466.26	2,489.81
Apartment		9,422.67	10,029.32	9,620.27	9,246.93	9,379.89	10,412.71	10,644.97	10,443.44	10,119.93	10,543.50
Cubic foot		1.139	1.132	1.237	1.088	1.215	1.242	1.1200	1.2359	1.2649	1.1877
Foundations & superstructure		4,925,519	7,791,338	3,698,904	13,969,573	6,944,712	4,570,613	16,900,324	5,678,632	5,196,075	12,335,800
Constructed room		1,771.77	1,933.33	1,761,38	1,729.12	1,664,20	1,984.63	1,929.04	1,905.58	1,924.47	1,942.04
Apartment		7,138.43	7,737.18	7,196.31	6,988.28	7,050.47	8,089.58	8,345.84	8,112.33	7,896.77	8,223.87
Cubic foot		0.863	0.873	0.925	0.823	0.913	0.965	0.8780	0.9610	0.9870	0.9265
Heating and ventilation		451,855*e*	657,600*d*	444,137*e*	1,207,677	702,505*e*	401,235*e*	1,378,000	552,576	440,000	1,259,800
Constructed room		162.55	163.18	211.49	149.48	168.35	175.53	157.29	185.43	162.96	198.33
Apartment		654.91	653.03	864.08	604.14	713.22	715.46	680.49	789.39	668.69	839.87
Cubic foot		0.079	0.074	0.111	0.071	0.092	0.085	0.0716	0.0935	0.0836	0.0946
Electrical construction		426,159	679,400	304,466	1,309,470	633,410	371,241	1,048,740	314,300	327,800	721,000
Constructed room		153.29	168.59	144.98	162.08	151.79	161.20	119.71	105.47	121.41	113.51
Apartment		617.62	674.68	592.35	655.06	643.06	657.06	517.90	449.00	498.18	480.67
Cubic foot		0.075	0.076	0.076	0.077	0.083	0.078	0.0545	0.0532	0.0623	0.0541
Plumbing		698,079	971,182	497,311	1,997,900	958,546	537,094	2,229,000	757,900	695,037	1,498,650
Constructed room		251.11	240.99	236.83	247.30	229.70	233.21	254.42	254.33	257.42	235.93
Apartment		1,011.71	964.43	967.53	999.45	973.14	950.61	1,100.74	1,082.72	1,056.29	999.09
Cubic foot		0.122	0.108	0.124	0.118	0.126	0.113	0.1158	0.1282	0.1320	0.1125
Piling abnormal foundations		230,000	1,337,000	50,000	400,000	100,000	352,000	727,000	143,000	700,000	644,000

a state-aided project *b* part 4 city-aided program: without cash subsidy *c* federally aided project *d* includes total cost of boiler *e* includes proportionate part of cost of boiler plant

Average* Costs of Buildings and Structures

Office of Assistant Secretary of Defense for Properties & Installations

Include inside utilities to a line 5 ft beyond the foundation walls, built-in building equipment, contingencies and costs for design, engineering, supervision, inspection and administration

For approximate cost of contract, including contractor's indirect costs, overhead and profit, apply a factor of 0.85 against these values

		Average* Unit Prices for Permanent Quality# Figured on areas in gross square feet			
Type of Structure	Unit	f1954†	f1955X	f1956	f1957
Academic classroom	sf	$10.75	$11.25	$11.75	$12.50
Administrative	sf	11.00	11.50	12.00	12.75
Armories	sf	13.00	13.50	14.25	15.00
Barracks and dormitories	sf	10.00	10.50	11.00	11.50
Bachelor officers quarters	sf	11.00	11.50	12.00	12.75
Bowling alleys	sf	14.00	14.50	15.25	16.00
Chapels	sf	21.50	22.50	23.50	25.00
Clinics	sf	23.00	24.00	25.00	26.50
Clubs, for enlisted men	sf	15.00	15.75	16.50	17.25
noncommissioned officers	sf	19.00	19.75	20.75	21.75
officers	sf	19.50	20.50	21.50	22.50
Cold storage	sf	20.00	21.00	22.00	23.00
Communications buildings	sf	25.50	26.50	28.00	29.00
Dispensaries	sf	23.00	24.00	25.00	26.50
Family housing, row type	sf	8.00	8.25	8.75	9.00
detached	sf	11.00	11.25	11.75	12.50
Fire and crash stations	sf	14.50	15.00	15.75	16.50
Gymnasiums	sf	14.50	15.00	15.75	16.50
Hangars, maintenance, except double cantilever	sf	15.25	16.00	16.75	17.50
alert	sf	15.00	15.50	16.25	17.00
nose-wing	sf	12.50	13.00	13.75	14.25
Hospitals	sf	24.00	25.00	26.25	27.50
Infirmaries	sf	23.00	24.00	25.00	26.50
Laboratories	sf	21.00	22.00	23.00	24.00
Libraries	sf	15.25	16.00	16.75	17.50
Messing facilities	sf	19.25	20.00	21.00	22.00
Operations building (administrative type)	sf	13.50	14.00	14.75	15.50
Parachute and dinghy buildings	sf	15.75	16.50	17.25	18.00
Post exchanges	sf	14.50	15.00	15.75	16.50
Recreation and hobby buildings	sf	16.00	16.75	17.50	18.50
Shops (average, all kinds)	sf	12.50	13.00	13.75	14.25
Warehouses: small, under 40,000 sf	sf	7.25	7.50	8.00	8.25
large, over 40,000 sf	sf	4.75	5.00	5.25	5.50
Swimpools, based on pool size					
without bathhouse	sf	12.00	12.50	13.00	13.75
with bathhouse	sf	26.50	27.50	29.00	30.00
Theaters	sf	17.75	18.50	19.50	20.25
Training buildings (operational)	sf	16.25	17.00	17.75	18.75
Security fence, chain-link, 6 ft high, 3 strands of barbed wire at top, normal complement of gates	sf	2.65	2.75	2.90	3.00
Engineering News-Record Building Cost index 1913 = 100		437	457	480	500

* Expect up to 20% higher or 20% lower costs in individual cases due to many variables

# For semipermanent or modified emergency, apply a factor of 0.85 against these values

For 3- to 5-year life, emergency quality, apply a factor of 0.60

For permanent construction overseas using U. S. materials, labor and equipment, practically duplicating U. S. designs, use factors shown in accompanying table showing variations outside the U. S.

For construction overseas of "less than permanent" quality, using local labor, materials, equipment and methods, factors are lower than these

X Based on experience and analysis of 1,500 cost reports for contracts bid during the period from August 1954 to August 1955

† Computed using ENGINEERING NEWS-RECORD Building Cost Index

f fiscal year

Factors for Estimating Costs Outside the U. S.

Technical Division, O. A. S. D. for P. & I.
Jan. 11, 1956

These factors apply to the unit costs shown in the accompanying table for preliminary planning only and only for permanent construction which substantially duplicates U. S. designs and uses U. S. labor, skills, methods, materials and equipment. They are not intended to take the place of or supersede engineering estimates by competent technicians familiar with local conditions.

These factors do not apply when local labor, materials, methods and equipment are used, when local conditions are known, or when construction standard is "less than permanent"

Continental United States, Washington, D. C. = 1.00

Alaska: Anchorage	1.7
Attu, Aleutians	3.0
Adak	3.0
Big Delta (Fort Greeley)	2.2
Eielson Air force Base	2.0
Elmendorf	1.7
Fairbanks	2.0
Kenai	1.7
Kodiak—Dutch Harbor	2.5
Ladd Air Force Base	2.0
Whittier	1.7
North of Alaskan Range	4.0
Azores, Lages	1.5
Admiralty Islands, Manus	2.0
Austria	1.0
Africa:	
French Morocco, General	1.5
French Morocco, Port Lyautey	1.3
Liberia	1.6
North Africa (Tripoli)	2.0
Bahama Islands	1.6
Bermuda	1.4
Cuba	1.4
Caribbean area (10th Naval District)	1.4
Caroline Islands (Truk)	1.7
Continental United States (Washington, D. C.)	1.0
Denmark	2.0
France	1.2
Greece	1.2
Greenland: Inland	+2.5
Coastal	2.5
Guam	2.0
Germany (West)	1.0
Hawaii	1.6
Iceland: Coastal	2.5
Inland	+2.5
Iwo Jima	2.6
Italy	1.2
Japan	1.2
Johnson Island	2.0
Labrador	2.5
Line Island (Palmyra)	2.2
Luxembourg	1.2
Marcus Island	2.6
Marianas Islands	2.0
Midway Island	2.2
Marshall Islands (Kwajalein, Majuro)	2.2
Newfoundland: Argentia	1.8
Interior	2.0
Norway	2.0
Okinawa	1.0
Panama Canal Zone	1.4
Puerto Rico	1.4
Philippine Islands	1.5
Saipan	2.0
Spain	1.0
Samoa	2.0
Sweden	2.0
Tinian (Mariannas)	2.0
Turkey	1.3
United Kingdom	1.3
Volcano Island	2.6
Wake Island	2.6

"EUC" S-12 SCRAPERS PROVE THEIR WORTH IN EVERY KIND OF DIRT

IN A CALIFORNIA DRAINAGE DITCH

. . . for a disposal plant north of Freeport, A. Teichert & Son moved 400 yds. per hour with two Euclid S-12 Scrapers. Loading conditions were good and hauls averaged 700′ to 1000′. About 80,000 yds. of earthmoving were involved in making the ditch 10′ wide at the bottom and 35′ wide at the top with 1:1 slope. Equipped with 10″ sideboards, the 218 h.p. "Eucs" averaged 15 yd. payloads. Easy loading and fast travel speed of these dependable Euclid Scrapers made quick work of the job.

ON A FLORIDA HOUSING SITE

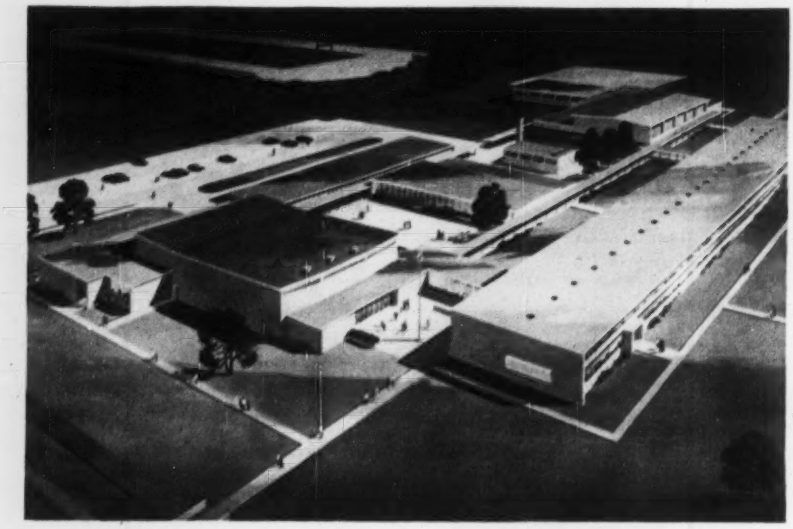
. . . near Sarasota, S-12 Scrapers proved that they move more yards at lower cost—regardless of soil conditions or application. Working in hard loading beach sand the three S-12's of Howard Thomas Const. Co. obtained heaped loads of 14 to 16 yards. And, availability was 98% in contrast to the excessive downtime and maintenance costs of four cable-operated scrapers which these hydraulic S-12 Euclids had replaced several months earlier. The high production and availability of the "Eucs" helped this contractor complete the job ahead of schedule.

- **Whatever your work—whatever kind of dirt—get a production-cost estimate on the S-12. Just check with your Euclid dealer . . . he can show you why *Euclids are your best investment.***

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE



KASHMERE GARDENS HIGH SCHOOL, from left to right: auditorium, shop building, cafeteria, boiler house, gymnasium, swimming pool. Buildings are light-weight roof deck on steel frame. Interior partitions are exposed clay tile sprayed with a speckled paint. Wainscots are glazed tile, ceilings, acoustical tile, floors asphalt tile with terrazzo corridors. Wirtz, Calhoun, Tungate & Jackson were the architects.

Unit and Ratio Costs for Texas High School

Data by Linbeck Construction Corp., Houston, Tex. for Kashmere Gardens High School, Houston, $2,089,000 Built Jan. 1956-June 1957—Area 148,200 sq. ft.

Items	Total $ thous	Unit $/sq ft	Ratio % of Bldg	Costs % of Total
Job overhead	$96	$0.65	4.90	4.60
Structural	456	3.08	23.29	21.83
Masonry	300	2.02	15.32	14.36
Finishes	596	4.02	30.44	28.53
Metal lockers	24	0.16	1.23	1.15
Chalk & tackboard	10	0.07	0.51	0.48
Gym partition	8	0.05	0.41	0.38
seats	9	0.06	0.46	0.43
backstops	2	0.02	0.10	0.10
Lab equipment	52	0.35	2.66	2.49
Kitchen equipment	32	0.21	1.63	1.53
Stage equipment	.5	0.03	0.26	0.24
Electrical work	115	0.78	5.87	5.50
Mechanical work	253	1.71	12.92	12.11
Building Total	$1,958	$13.21	100.00%	93.73%
Site earthwork	34	....	....	1.63
Covered walks	21	....	....	1.00
Sidewalks	25	....	....	1.20
Paving	25	....	....	1.20
Storm drainage	10	....	....	0.48
Concrete tunnels	7	....	....	0.33
Chain link fence	9	....	....	0.43
Site work total	$131	....	....	6.27%
Project Total Cost	$2,089	$14.10		100.00%

Prices Go Up 9% on Elementary School

Linbeck Construction Corp., Houston, Tex. analyses factors contributing to a 9% price rise for Texas School, postponed for 18 months.

This is a 26 classroom elementary school with kitchen and combination cafeteria-auditorium. The building area is 35,450 sq ft, the 1957 contract price is $420,500.

Items	Bids Taken Nov. 1955 Work Postponed	Rebid May 1957 18 months later	% Increase	1957 Prices Unit $/sf	1957 Prices Ratio % of tot
Bond & Builders Risk	$3,620	$3,924	8.4%	$0.11	0.93%
Overhead	12,174	12,174	none	0.34	2.90
Drilled Footings	1,074	2,427	126.0	0.07	0.58
Earthwork	6,674	6,674	none	0.19	1.59
Concrete Material	21,315	25,725	20.7	0.73	6.12
Form Material	6,513	6,513	none	0.18	1.55
Reinforcing steel material	20,815	22,735	9.2	0.64	5.41
Structural labor	19,933	20,128	1.0	0.57	4.79
Cement finish	3,547	3,547	none	0.10	0.84
Masonry	42,690	39,460	(−7.6%)	1.11	9.37
Roof fill	5,475	5,990	9.4	0.17	1.42
Roofing & sheet metal	12,891	13,988	8.5	0.39	3.33
Waterproofing	2,191	2,491	13.7	0.07	0.59
Carpentry	12,856	13,653	6.2	0.39	3.25
Misc & orn metal	3,400	3,800	11.8	0.11	0.90
Steel windows	16,208	16,000	(−1.3%)	0.45	3.80
Hollow metal	3,025	4,312	42.5	0.12	1.03
Chalk & tackboard	5,147	6,289	22.2	0.18	1.50
Kitchen equipment	12,815	13,200	3.0	0.37	3.14
Metal shelving	915	1,100	20.2	0.03	0.26
Misc. specialties	2,844	2,665	(−6.3%)	0.08	0.63
Millwork	17,025	19,300	13.4	0.54	4.59
Hardware allowance	6,000	6,000	none	0.17	1.43
Lath & plaster	16,976	19,212	13.2	0.54	4.57
Painting	5,616	7,052	25.6	0.20	1.68
Resilient tile	3,775	3,900	3.3	0.11	0.93
Ceramic tile	3,340	3,532	5.8	0.10	0.84
Terrazzo	8,000	10,600	32.5	0.30	2.52
Marble	2,450	2,875	17.3	0.08	0.68
Glass	6,065	6,685	10.2	0.19	1.59
Electrical	24,900	27,808	11.7	0.78	6.61
Mechanical	41,518	52,755	27.0	1.49	12.54
Sitework, adjusted	18,986	18,986	none	0.54	4.52
Profit	14,000	15,000	7.1	0.42	3.57
Total	$384,773	$420,500	9.3	$11.86	100.00%
$/S.F.	$10.85	$11.86			
ENR Building Cost Index, 20-city	479.30	501.37	4.6%		
Dallas	425.84	439.11	3.1		

Mechanical Trades Are Big Contributors to Rise

It cost one Texas Community $36,000 to postpone its 35,450 sq ft. elementary school construction for 18 months.

The detailed analysis of what contributed to this 9% price rise from November 1955 to May 1957 is provided by R. J. Simmonds, vice president, Linbeck Construction Corp. of Houston.

Masonry went down 7.6% which Mr. Simmonds can explain only by the extreme competition among subcontractors.

These prices are further evidence of the 1957 trend across the country for contractors to catch up some on the lag in their price rise behind the rise in cost of what they have to purchase to build.

The latter as measured by the ENR Building Cost Index went up 4.6% in the 18 month period covered while the ENR Dallas Building went up 3.1%.

In the school bids mechanical costs, plumbing and heating, up 27%, contributed heavily to the overall rise, electrical work more moderately at 11.7%. Concrete material up 20.7%, terrazzo 32.5% also accounted for a large part of the rise.

The sitework varied somewhat for the bids taken in 1957 but the contractor has made adjustments to eliminate the effect on the final costs of the changes.

The accompanying table shows item by item how the price rise built up over the period of delay.

3 Differences that aren't in the policy

All Workmen's Compensation and Public Liability policies read pretty much alike. The difference shows up on the job.

1. Effective Accident Control: When you're insured with The Travelers, expert safety engineers are available to help you prevent accidents *before* they happen. (Over the years The Travelers has spent more than $100 million on accident and fire prevention and inspection services.)

2. Prompt Claim Service: If you *do* have a claim, one of the 251 Travelers claim locations from coast to coast gives you prompt *on-the-spot* service. The burden of suits and settlements is off your shoulders. You're free to go ahead with your project.

3. Complete Employee Rehabilitation Program: The Travelers complete Employee Rehabilitation Program assures your people the best medical care. Everything that *can* be done *is* done to restore injured workers to good health.

In these days of close profit margins and greater risks, these differences are well worth considering. Call your Travelers agent or broker for full details.

The Travelers service for contractors also includes: *Contractors' Bond Service* with speed and know-how. *Contractors' Equipment Floaters* and *Builders' Risk* insurance serviced by a nationwide claim organization that can give you prompt attention anywhere.

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ARCHITECTS COLLABORATIVE, CAMBRIDGE

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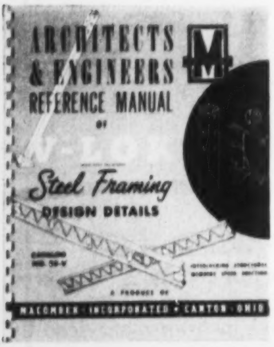

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That's why V-LOK Steel Framing cuts construction time in half . . . 7 or 8 months instead of 12 or 14 months.

V-LOK reverses the old procedure of waiting months to lay up masonry walls and partitions so that a school can be roofed in and interior work started.

V-LOK with curtain walls designs into every need of the modern school and the Architect's structural requirements at a cost per square foot that warrants first consideration in every school district.

It only takes one V-LOK job and the savings in erection time to make a School Board and the tax payers in that district your friends for life. The V-LOK Design Manual will be a welcome addition to your files. Send for it.

MACOMBER CANTON 1, OHIO

A survey of contractors doing more than 20% of the nation's highway work shows that . . . . .

Slow Payments Push Costs Up

Highway contractors are being hurt by the payment and retainage policies of many state highway departments. In turn, suppliers of contractors' material and equipment are also suffering from these policies—which in many cases were adopted many years ago.

States could save millions of dollars annually by a radical change in their payment policies for highway contractors. The monies saved would be taxpayer dollars that could buy more miles of road, or could increase the pay scale for state highway engineers.

Highway department engineers are responsible, but not to blame, say most contractors, for the payment practices which are causing so much trouble. The roadbuilders feel that state engineers are overworked, underpaid, given too much responsibility, too little authority, and for the most part are doing the best they can under the circumstances.

Payments to contractors can be made promptly. The experience of several of the states proves it possible to achieve equity for both the taxpayer and the contractor. The contractors themselves have many reasonable and practical suggestions for improvement of the conditions.

Highway officials paint a brighter money picture than contractors. The state men admit that possibly the situation could be improved, but their claims on payment practices just don't jibe with the actual experience reported by the contractors.

Editor's Note: How are roadbuilders affected by retainage and payment policies? ENGINEERING NEWS-RECORD has asked them and has studied payment reports from the states.

The answers are indicated above and documented on the pages that follow. Replies came from 182 contractors in every state in the union, from contractors doing annually $536 million worth of state highway work —or more than 20% of the U. S. total based on an average of the past three years.

So concerned are contractors with retainages and payment policies that replies to ENR's three-page questionnaire came from about a quarter of all who received it—a significant sample. They came signed by presidents and other officers of firms doing from $300,000 to $35 million worth of highway work a year.

Only highway contractors were polled. Of course the retainage and payment-delay problems are not limited to highway construction. But in highway work the focus is sharper: Forty-eight state highway departments are the owners; and the roadbuilders are most generally prime contractors, seldom if ever, brokers who subcontract to many subcontractors.

Only four contractor replies in 186 had to be thrown out for being so extreme as to be suspect; these were four unsigned questionnaires.

The complex task of formulating this survey, analyzing its results and preparing the report on the pages that follow was assigned to Edward M. Young, Jr., of ENR's staff. His 17 years of contracting experience have prepared him for the task.

● ● ● ▶

Slow Payments Raise Costs and Lower Profits

(Continued from page 293)

Edward M. Young, Jr.
Assistant Editor

Of all tight money in an admittedly tight money market, none is quite so tight as that held by the state highway departments and owed to the highway contractor for work completed.

It is true that the problems of slow payments are by no means confined to the roadbuilding sector of the construction industry, or for that matter, to the construction industry. However, because of the current multi-billion federal highway program, ENGINEERING NEWS-RECORD has put a spotlight on the highway field.

From the results of a nationwide survey, it is possible to draw a number of conclusions:

How and Why

In no other industry does the purchaser withhold from the producer so much money, in so many ways, for so long a period of time. The highway contractors and in turn their suppliers of materials and equipment, are being hurt—some badly—by the payment policies of the states.

There is—or was—a reason, of course. The construction industry's record on completing work has often been so bad that many owners have felt it necessary to insure completion by holding a monetary club over the contractor in the form of a retainage of some of his money. In the present day, when completion bonds of 100% are usually required, it has often been contended that these retainages are no longer necessary to protect the owner.

The most obvious way in which a state can withhold money from a contractor is through the use of a "specified retainage"—that is, by withholding from the progress payments a percentage (specified in the contract) of the value of the work done during given periods.

The size of this retainage varies from state to state, and even on single jobs within the states, as the work progresses. For example, Idaho starts its retainage at 5%, and maintains that rate throughout the job; Wisconsin begins with a 15% retainage on work done, but limits the amount to 7.5% of the total contract price. Washington varies its retainage with the size of a job.

Colorado, Connecticut, Delaware, Georgia, Maine, Montana, Nebraska, Nevada, and New York retain 10% of the progress estimates, until the job is 50% complete. After that, they deduct no further money. North Carolina withholds 10% of the first 50% of a project, then reduces the retainage to 5% of all subsequent estimates. In 28 other states, the retainage is specified as 10% of all estimates through the entire course of the job.

• Time is factor—The time element in retainage is also of major concern, since it affects the time during which money is not available to the contractor.

The states do not admit holding retainages overlong, but a study of their policies, as compiled by the American Road Builders' Association, shows great variations on this point.

Illinois claims it will release 90% of its 10% retainage when a project is 90% complete. But Idaho, Indiana, Texas and Washington do not release any of the retained money until final payments are due.

Between these extremes is New York, which under some conditions will re-

PROGRESS PAYMENTS

STATE	THE STATES claim . . .		BUT CONTRACTORS report	
	payments are made: M—Monthly SM—Semi-Monthly (c) Under certain conditions	time from date of estimate to payment of contractor is this many DAYS:	time from date of estimate to receipt of payment in this many DAYS:	
			Most frequent	Range
ALABAMA	M	10	12	8–12
ARIZONA	M	15	20	7–20
ARKANSAS	SM (c)	7	*1	*1
CALIFORNIA	M	10	20	8–30
COLORADO	M	10	20	15–30
CONNECTICUT	M	15	22	20–30
DELAWARE	M	5	14	12–15
FLORIDA	M	5–12	14	10–150
GEORGIA	M	10–14	10	10–15
IDAHO	M	5	14	13–15
ILLINOIS	SM (c)	20	30	10–105
INDIANA	SM	23	25	20–30
IOWA	SM	10	18	14–21
KANSAS	M	10	15	10–30
KENTUCKY	M	10	14	14–21
LOUISIANA	M	15	15	None
MAINE	SM (c)	5	10	10–14
MARYLAND	M	6–10	20	15–45
MASSACHUSETTS	SM	10	30	20–35
MICHIGAN	SM	15	30	18–45
MINNESOTA	M	3–5	14	8–40
MISSISSIPPI	M	12–16	14	10–20
MISSOURI	SM (c)	10–14	20	10–30
MONTANA	M	15	18	15–30
NEBRASKA	SM (c)	14–21	25	20–30
NEVADA	M	10–15	*4	*4
NEW HAMPSHIRE	SM	7	12	10–15
NEW JERSEY	M	10	30	15–90
NEW MEXICO	M	10–14	14	10–21
NEW YORK	SM (c)	10–14	25	20–30
NORTH CAROLINA	M	15	10	5–15
NORTH DAKOTA	M	5–10	10	7–10
OHIO	SM (c)	10–14	15	10–21
OKLAHOMA	SM (c)	20	15	10–30
OREGON	M	15	30	20–60
PENNSYLVANIA	SM	11	12	6–15
RHODE ISLAND	SM	2–5	30	*5
SOUTH CAROLINA	M	5–10	10	10–12
SOUTH DAKOTA	M	20	15	15–30
TENNESSEE	M	10	10	7–14
TEXAS	M	10	15	8–60
UTAH	M	5–10	15	15–20
VERMONT	SM	5–7	*4	*4
VIRGINIA	M	10	14	5–30
WASHINGTON	M	10–14	21	12–60
WEST VIRGINIA	SM (c)	12–15	10	. . . . .
WISCONSIN	SM	7–10	30	18–51
WYOMING	M	5	10	3–15

*1 No report for this item
*2 None, reports too varied
*3 Figure finals during winter
*4 Only reports were: good, no complaints, fine, etc.
*5 Only one numerical report on this item.

lease half the retainage prior to the payment of the final estimate.

But because of differences in the payment policies, a Texas contractor can generally get all his money, including retainage, in less time than a New York contractor can get half the retainage. Texas makes final payment within four weeks after job completion. New York takes six months or more.

Obviously, it is impossible to make any general statement about specified retainages, except that they are appreciable in size, long in duration and of great concern to the contractors.

• **Big sums involved**—When viewed as individual figures, these retainages may seem small. On an industry-wide basis, however, they have tremendous significance.

Contractors replying to ENR's survey reported $42.52 million outstanding in retainages. Since the aggregate annual volume of ENR's sample group represents 20.9% of the annual average of all state highway work for the past three years, it can be assumed that at any given time the highway contractors of the country have outstanding in specified retainages alone more than $200 million (In a report compiled by the American Road Builders Association in 1957, Nello L. Teer, Jr., estimated this retainage will be $450 million on $5 billion worth of work).

All of this is earned money that the contractor cannot use and can't even borrow against. Bankers—even specialists in contractor loans—have come to regard retainages as "contingency funds" which can easily disappear if a contractor gets caught off base or a state engineer discovers an overpayment.

Bankers do not regard retainages as liquid assets, because the time element in payment is too long and varies too greatly. (Contractors reporting to ENR claim that not only are the retainages held in total or in part during the life of the job, but are held past completion of the job for periods that range from 30 days to three years.)

FINAL PAYMENTS

THE STATES claim . . .	BUT CONTRACTORS report . . .		
time between project acceptance and payment of final estimate is this many weeks:	time between completion of project and receipt of final payment is this many WEEKS:		where retainages are collectible if job extras are in dispute:
	Most frequent	Range	
6	26	26-40	No
*1	*2	16-26	*1
16-26	*2	Up to 20	*1
4	6	4-8	yes
8	12	6-26	no
8	18	12-26	partial
10-20	18	12-26	yes
8-12	12	8-16	no
8	26	12-60	no
12-14	12	*2	no
14	16	4-26	98%
16	26	26-52	no
10	10	8-12	no
12	16	8-26	sometimes
12	26	12-78	no
8	*2	12-40	90%
4-20	*3	8-40	yes
30	30	12-78	no
10-20	30	12-52	partial
4-16	16	8-52	partial
4-8	34	4-108	no
8-10	12	8-26	partial
4-6	26	8-52	partial
2-20	12	7-52	no
20-36	43	26-130	no
5	*4	*4	*1
25	20	16-26	partial
4-6	12	8-38	no
3-4	10	4-20	90%
12	26	8-130	no
16	40	26-78	sometimes
5-6	*3	3-20	no
2-3	20	8-52	no
6	6	4-16	sometimes
11	12	8-26	no
12	26	4-78	rarely
12	*5	12-26	partial
4-12	26	12-78	partial
25	26	12-52	no
60 days legal	26	4-34	90%
2	4	3-26	no
8	12	8-26	no
8-12	12	*5	
12	12	8-26	yes
6	8	7-26	sometimes
6-20	12		no
4-52	20	16-26	no
40 days	6	3-8	yes

Other Forms of Retainage

The impact becomes greater when it is remembered that the "specified retainage" is just one of the several monetary holdbacks used by the states. Four other such holdbacks are:

1. The so-called "private retainage"
2. The retention until final payment of money due for quantity over-runs,
3. Failure to pay for materials delivered but not incorporated in the work
4. Delays in making final payments.

• **Private retainage**—This is a phenomenon restricted principally to unit price jobs.

It stems from the apparently universal fear of resident engineers that they may overpay a contractor.

Methods of enforcing private retainage are simple. The engineer does one of two things (and sometimes both):

He either underestimates an unprovable quantity (as in earthmoving), or he underrates the value to the state of a known quantity in a partially completed operation.

Against this form of retainage, the contractor has little defense, until the final quantities are computed—perhaps months later.

In this case, the contractor is not so fortunate as are other business men. For example, a dealer delivering eight automobiles to a state on a 10 vehicle requisition, has produced only 80% of his order. Yet, he can point to eight identifiable units, each with a specific value and each usable without regard to the others. But in earthmoving, the contractor cannot quickly or definitely establish his units (cubic yards) and the engineer can, and according to reports, generally does, appreciably underestimate quantities.

As for underrating the value of a known but incomplete quantity of work

(Continued on page 296)

. . . Slow pay hurts both state and roadbuilder

(Continued from page 295)

—who, for instance, can determine the value of a bridge which may be 90% complete as to cost, but actually only spans three-quarters of a river?

In these cases, the contractors admit the engineer has a legitimate peg on which to hang his conservative hat. They object, however, to the whole wardrobe going on the peg, and this, they say, happens.

Of the reports on this point, 58.6% charged state engineers with invoking private retainages of from 5 to 20% of the value of work done during requisition periods. This, in the words of one New York contractor, "pushes the actual retainage from the 10% it is supposed to be up to 20% or even 30% at times".

• **Overrun payments** — Holding back money due for overrun quantities until final payment is another serious problem to roadbuilders.

More than 57% of the reporting contractors claim that they do not get paid for overruns until the final payment is made for the job. And 93% of these claim that it hurts. It probably does, since the most common overrun item is in the earthmoving—one of the early operations on a highway job.

One interesting sidelight to the overrun problem is that it exists in every state. The significance of this is in the explanation given, without exception, by every reporting contractor: There are not enough state engineers to handle the computation of final quantities.

• **Unincorporated materials**—Failure of the state to pay for materials delivered to, but not incorporated in, the work, does not yet seem to be a problem among highway builders. Less than 5% of the returns contained any reference to it. This is not surprising since, except for piles, mesh, and structural steel for bridges, the amount of materials stored for a highway job is comparatively negligible.

However, in the Federal Highway program this may become a problem and the states may be as helpless as the contractors in this regard since, under the Federal Highway Act of 1921, such payments are not permitted.

• **Final Payments**—Delays in final payments are another sore spot with the contractors in many states. Two principal reasons for delays are given:

First, resident engineers just don't have time or manpower enough to figure final quantities as they are developed. Maine and North Dakota don't even try. The computation of "finals" waits until the field engineers come into headquarters for the winter. Although Maine's payment policies were generally regarded as good by contractors, delays of up to 10 months were reported for receipt of final payments.

The second reason—and one which is greatly resented—is the widespread use by certain states of the final payment as a club over the head of a contractor with claims for extras. On the theory that if a contractor needs money badly enough, he will waive part or all of even a legitimate claim for extras, some states are reported to "just sit on the finals."

Financial Effects

These financial problems are pointed up by the fact that few groups serving the states are in a poorer position than the highway industry to shoulder the financial burden imposed. The reasons are many.

• **Profits are low**—Because of its highly competitive nature, the construction industry as a whole has always been a low profit industry. And the profit margin for contractors is dropping even further.

According to Dun & Bradstreet, in 1955 the ratio of net profits to sales for all contractors was 1.52%. As low as this figure seems—it is less than half the average net profit of all other industries combined—it is borne out in many ways.

In a speech before ARBA last January, Guy C. Kiddoo, vice president of the First National Bank of Chicago, pointed out that in 1947, contractor net profits on work performed were 5%. In 1954, the figure had dropped to 1.29%. Mr. Kiddoo also pointed out that in 1939, 4.4% of all business failures were in construction. By 1955, the figure had risen to 12.8%.

Income tax returns for 1953 show that construction corporations had a net profit after taxes of 1.5%. If profits as shown by tax returns are suspect, consider some further information advanced by Mr. Kiddoo, who said:

"Our bank probably does more business with contractors than any other bank in the country, and perhaps our larger customers may do somewhat better than the average. Twenty such good representative firms in heavy engineering and highway work, in their last fiscal years, on a total volume of $165.7 million had profits of $2.99 million, or a modest 1.92%."

And it should be remembered that this is a figure for contractors whose financial stability enabled them to use standard banking facilities. A far greater number of contractors, many of them with excellent banking connections, must often resort to the use of private coverage to tide themselves over a momentary financial hump. The interest and bonus on such credit for short-term working capital often pushes the cost of money up to more than 50% per annum.

• **Labor, equipment costs high**—In few industries are the pay scales as high as they are in construction. The weekly payroll is a major consideration for the roadbuilder, for while machines continually get bigger, automation has yet to take over.

Nonetheless, outlay for equipment is tremendous. It has been said that every dollar's worth of road contract requires a dollar's worth of machinery. Furthermore, according to S. D. Maddock, chairman of the Executive Committee of the Commercial Investment Trust Corporation, the estimated increase in equipment credit for each $1 billion increase in highway work is $285 million.

• **Financing is difficult**—As previously mentioned, retainages, which, according to the survey, amount to 7.93% of the contract volume, are not regarded by banks as satisfactory collateral for loans.

As Kiddoo puts it, "most banks view contractors' applications for loans with that "mythical glass eye".

The financing of new equipment and repair parts (which according to an ARBA Task Force amounts to 20% of the contract volume) through commercial banks is virtually impossible. Highway equipment is too limited in use, too hard to keep track of because of its mobility, and subject to too many prior claims by bonding companies and contracting agencies to be of interest to banks.

To further complicate matters, the highway contractor can't raise money on his finished product. A speculative homebuilder can get a mortgage, the manufacturer of toys can pledge his inventory against money borrowed. Highway contractors can do neither—a two-mile stretch of road is of little value to a bank, even if it could be repossessed.

• **Policies are old**—The policies under which most states still operate were established many years ago.

At that time, road costs were low, and contracts relatively small.

In general, the roads followed all but the most extreme contours of the land, paving was often little more than an oil coat, and time limits for construction were very flexible.

But the requirements of the 1957 highway, with its multi-laned dual roadways, with more than one major structure per mile, with grades limited to 3%, have pushed costs up to a point which strains the financing ability of even the largest contractor.

As a matter of fact, ENR's survey shows that while all contractors—big and small—are being pinched by the payment policies of the states, the money problems of the big firms are proportionately larger than those of their smaller contemporaries.

But many highway departments are still buying 1957 roads in 1920 terms. And, in doing so, they are imposing what the contractors say is an unjust burden on both contractor and supplier.

A truism unique in contracting is that the tenth of the month is just another day—unless a check comes in. Most often, contractors pay their bills after they receive their own payments.

States Can Save

In a field where competition is so keen that contractors are now working on less than a 2% profit margin, any savings which can be effected by the industry as a whole will be passed on to the states.

• **Interest reduced**—Contractors' interest charges would be reduced. In an industry in which 50% per year is not an unusual cost for short term money, prompt payment of invoices and a reduction or elimination of retainages would result in tremendous savings to the contractor.

Any argument that the savings would not be reflected in lower bid prices is nullified by an analysis of present profit ratios. The competition which has forced contractor profits to less than half that of the average of all other industries will continue to exert its pressures and will force continuing low bids. Even if, in improving payments to contractors, the states incur some additional financing cost to themselves, the possible savings will far outweigh the added costs.

More than 36% of the contractors questioned in ENR's survey admitted specifically that they increased their bid prices to compensate themselves for retainages and slow payments.

A somewhat amusing sidelight—but one which reflects the truth of the situation—was found in the answers of the remaining 64%. While denying that they raise their bid prices because of slow payments, many admitted that, were it not for poor payments, they could reduce their bid prices. This apparent contradiction has a logical explanation. In some way, every contractor must (or at least should, if he wants to stay in business) cover the cost of borrowing replacement capital. Even if he does not borrow this capital, he must somehow compensate himself for his inability to use that part of his money which is withheld.

Therefore, in spite of the denials, there is no doubt that the cost of the money held is figured somewhere in the contractor's bid.

Further, merely on the reports of the 36% who admit raising prices to cover retainages and slow payments, the states could save more than $15 million annually by improving their payment policies. While $15 million, considered in the light of the whole highway program, is not a large figure, it is significant if applied to manpower. With it, the states could hire an additional 2,500 engineers at $6,000 annually, or they could grant a $3,000 annual increase in pay to 5,000 of their present employees.

• **Capacity raised**—Another saving to the states would result from the increased capacity of the industry. It is known that contractors will often take jobs just to keep working. Thus, while it may not be particularly advantageous to the contractor, an increase in the capacity of the industry will increase competition.

And a capacity increase is possible. In answer to the question: "If your projects had no retainages, could you handle more work?", 68.18% of the contractors replied in the affirmative. Of these, 93 claim they could do from 5 to 50% more work.

It is interesting—and revealing—that those contractors who said they could increase their capacity were not limited to any particular annual volume or to any particular state. One western contractor, reporting $300,000 in yearly volume (with $45,000 tied up in retainage) said he could raise his capacity by $150,000. This is a little better than $3 worth of work for every dollar now tied up.

An eastern contractor, doing $20 million annually, with more than $2 million outstanding in retainages, said he could handle an additional $10 million of work. This is $5 worth of work for every dollar tied up.

As high as these two estimates of potential increased capacity may seem, both are far below the generally accepted rule of thumb that says that a contractor can handle $10 worth of work for every $1 of liquid assets.

In total, the ENR survey shows that the reporting contractors could increase their annual working capacity by $120.9 million, if there were no retainages. This could mean an increase in the work capacity of the nation's highway contractors of more than $600 million annually—a 24% increase over the work now being done.

• **More bids per job**—The third, and perhaps most important effect of improved payments will be found in an increase in the number of bids submitted. Contractors now limited financially would be able to bid on a greater number of jobs. A typical example of how such savings could be effected is a part of a letter to ENR from an eastern contractor.

This contractor was doing two jobs for the U. S. Corps of Engineers, and had passed the 50% completion mark. Because of the retainage policies, the contractor knew that no additional retainages would be withheld. He said:

"Therefore, we knew we would be able to finance a state job of $2.8 million without requiring additional funds. Otherwise we would not have bid the job, and the low bid would have been $243,000 higher than ours."

Keep Some Retainage

Where retainages are concerned, state highway officials seem adamantly opposed to anything more than partial reductions. Only Delaware, Iowa, and Wyoming would consider a 5% retainage for the first 50% of the job, then no additional retainage.

On the question of holding 5% for the entire job, there was an almost even split. (Idaho and Wyoming, with the lowest retainage in the country, now do just this). The preference, by about 2 to 1, is for a retainage of 10% for the first 50% of the work and then no retainage on the balance.

• **Some Retainage Good**—ENR's survey reveals that the highway departments are not alone in their desire to maintain some retainage. More than 56% of the contractors polled are decidedly in favor of retainages—but at an appreciably lower rate and for a different reason than the states.

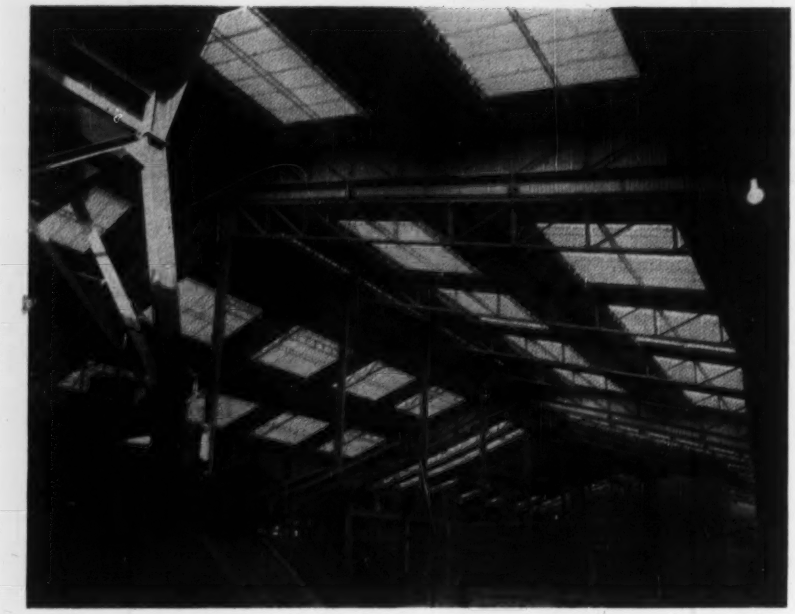
The contractors favoring retainages feel that they should be reduced to a maximum of 2% to 5%. Many also said that if a job is almost completed when it is closed down by winter, all the retainage should be paid except for enough money to cover completion costs. This would protect the states but would eliminate the situation where a contractor is deprived of $100,000 because $1,000 worth of seeding remains to be done on an otherwise completed million dollar contract.

With four exceptions, the contractors favoring retainages do so solely to protect themselves from cut-throat competition of "fly-by-nights" who, without retainages, might decide to get into highway work.

In no case do the contractors think that the states need the protection of retainages. They are adequately protected in other ways, such as:

Bonds—Every state requires a payment and performance bond of its contractors. Michigan calls for a bond in

(*Continued on page 298*)



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. . . Slow pay hurts

(*Continued from page 297*)

the amount of 50% of the contract price and Delaware requires 75%. Most other states are protected by bonds for 100% of the value of the work. In the event of default by the contractor, the state has the right to make the bonding company get the job finished at the contract price.

Prequalification—All but eight states require prequalification of contractors figuring highway work. Under this system, state accountants and engineers check regularly submitted financial statements and performance records for the purpose of setting a limit on the size or type of job on which a contractor will be permitted to bid.

Private retainages—The inevitable "private retainage" affords a large measure of protection for the states.

Delay in progress payments—Because of the time required to process requisitions, the states, in any case, are always from one to six weeks behind in paying the contractor. For example, a contractor does $100,000 worth of work in June. On July 1, he puts in a requisition. If, as in many states, it takes three to four weeks for his payment to be processed, he may well have done another $100,000 worth of work before he is paid for the first quantity done.

Who's to Blame?

The responsibility for all types of payment delays is placed mainly on the desk-top of the resident engineer. Yet the resident engineer is not blamed. He is regarded by most contractors as a victim (like themselves) of antiquated systems, made unwieldy by too much red tape and too few men.

In general, the contractors feel that the resident engineer is overworked, underpaid, given too much responsibility and too little authority, and for the most part, does the best he can.

Some typical comments on this point: "Resident engineer does not have time to complete final figures during the construction season" . . . "A reduction in paper work would help the resident engineer to help us" . . . "Give the resident engineer more authority" . . . "Our trouble is not a shortage of money, but of engineers".

What Can Be Done?

It is obvious that the payment policies and practices of many state highway departments are badly in need of improvement. It is equally obvious that this improvement is possible and that it in fact, has been accomplished by several states. This is evidenced by the uniform satisfaction expressed by contractors reporting on those states.

(*Continued on page 300*)

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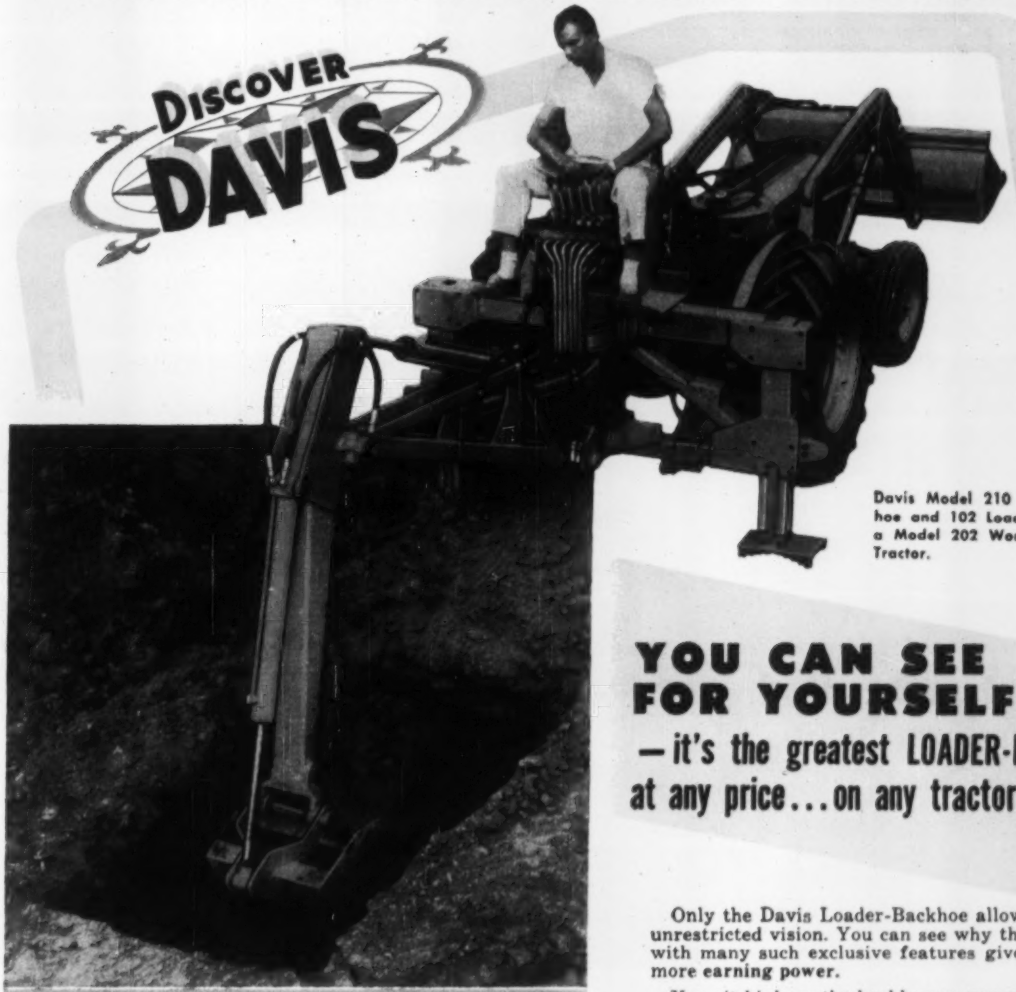

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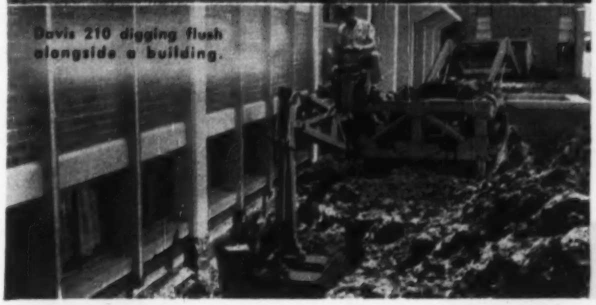

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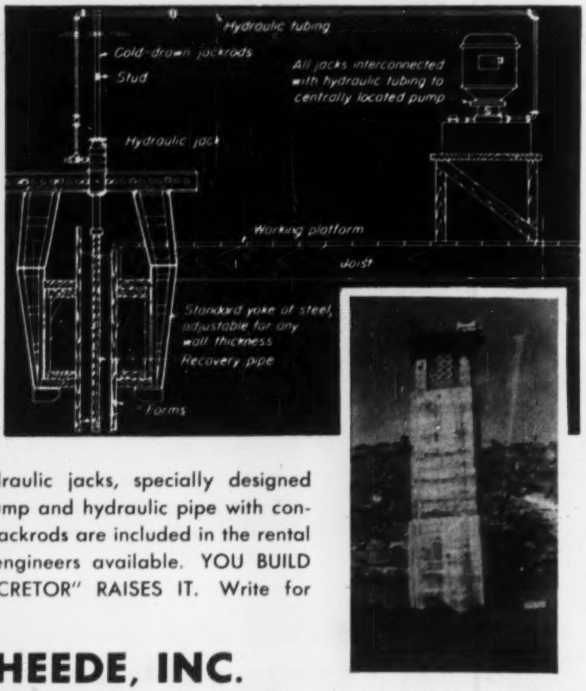
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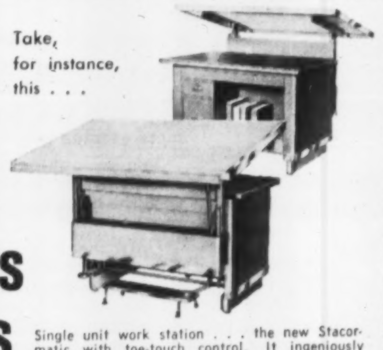

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. . . Slow pay hurts

(Continued from page 298)

One enthusiastic California contractor summed up the general viewpoint with, "The Division of Highways of the State of California as being the model from which others should pattern their procedures." A Texas contractor reports, "Our State Highway Department's method of payment is fair and needs no criticism". From Oklahoma—"Our highway department is very fair with contractors—no complaints from us." From Vermont, "We get fair estimates by engineers—never wait longer than 90 days for a final payment."

Further proof that the conditions can be bettered is found in the payment table accompanying this article. Wyoming makes progress payments in ten days, though Wisconsin takes 30 days. Texas can make final payments in four weeks, and Oklahoma in six, but New York, Kentucky and Georgia need 26 weeks. Idaho holds its contractors in line with a 5% retainage, Ohio needs 15%.

The answer, say the contractors, is that what one state can do, any other state can do—if it will. To this end, almost every contractor made some suggestions—most of them reasonable, all of them sincere. Many are worthy of consideration. For example:

1. Set up arbitration boards to settle disputes promptly between the contractors and the states. Litigation, so costly to both state and contractor in time and money, can be avoided.

2. Make the bond premium a contract item payable by the state with the first estimate.

3. Increase field personnel to permit quick and accurate determination of quantities.

4. Give the resident engineer more authority—particularly in approving payments for obvious overruns as they occur.

5. Pay for contract materials delivered to the job site but not yet incorporated in the work.

6. Require that states pay interest on any money withheld from the contractor longer than 60 days after due date. (Pennsylvania has just adopted a modification of this principle—it will pay interest on final payments not made within 90 days after job completion.)

7. Adopt more reasonable retainage practices.

8. Streamline the entire payment system and make it simpler.

9. Pay for completed structures independently of road work. Since structures are ordinarily finished first, this will free contractors money for subsequent road work.

10. Bid more items on lump sum and save endless computations.

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A check list of things to be done so that a percentage-of-completion accounting procedure can realistically reflect your profit and loss position

Comparison of Methods of Profit Determination At the End of a Fiscal Year

	METHOD #1 Cost Incurred	METHOD #2 Billings Rendered	METHOD #3 Elapsed Time	METHOD #4 Physical Compl. Contract A Unit	METHOD #5 Physical Compl. Contract As Sum of Parts
Estimate of total profit to be earned	\$150,000	\$150,000	\$150,000	\$150,000	\$150,000
Profit computations:	$\left(\frac{900{,}000}{\$2{,}620{,}000}\right)\times\$150{,}000$	$\left(\frac{\$\ 720{,}000}{\$2{,}770\ 000}\right)\times\$150{,}000$	$\left(\frac{3}{18}\right)\times\$150{,}000$	20% × \$150,000	Earthwork \$555,000 Price (100% Compl.) 600,000 Cost
Realized profit (or loss) at end of fiscal year (to nearest \$000)	\$52,000	\$39,000	\$25,000	\$30,000	(\$45,000)

METHOD #1: Percentage of completion represented by the ratio of cost incurred to date (\$900,000) to total estimated cost (\$2,620,000).

METHOD #2: Percentage of completion represented by the ratio of billings rendered to date (\$720,000) to total contract price (\$2,770,000).

METHOD #3: Percentage of completion represented by the ratio of time elapsed (3 months) to the total time period of the contract (18 months).

METHOD #4: Percentage of completion developed by engineering analysis of physical completion and expressed as a ratio (20%) of the total work to be done. This method assumes that the estimated \$150,000 profit will be earned at a uniform rate over all segments.

METHOD #5: Percentage of completion developed by engineering analysis of physical completion on each significant construction element and expressed as a ratio of the total work in each element. Realized income on the contract is the sum total of the realized income on each of the individual segments, determined by applying the individual percentages of physical completion to the total estimated profit for each of these segments. In the above example, the earthwork, which is 20% of the job, is 100% complete.

J. H. Hennessy, Jr.
A. T. Kearney & Co.
Management Consultants
Chicago, Ill.

Too many contractors operating under the **percentage-of-completion method of accounting** do not have a realistic idea of their profit or losses in any given accounting period. And yet, for most of these contractors, it is only through the use of this method of accounting—which permits progressive determination of profits throughout the life of a contract—that realistic allocation of income between accounting periods can be made.

It is on the lump sum contract, and particularly those involving facilities which are largely unique instead of repetitive, that the problems of periodic profit determination arise. Contractors on subways, dams, and complex industrial and chemical plants, for example, have more unknowns to deal with than do those on highway construction or on conventional building work. The latter group usually have the cost records and experience from very similar former jobs to guide them—first in preparing their estimates and then in measuring progress and determining periodic profits.

The more complex facility also usually involves a larger investment risk, and it is a longer term proposition. As a consequence, errors in estimating realized periodic income can often be disastrous or, at least, can complicate financing of additional projects, or can result in needless advance payment of federal and state income taxes.

For these reasons it may be useful to compile a check list of things to be done and to be guarded against when employing the percentage of completion method of accouting on large, lump sum, long term contracts. This article attempts to do that by discussing the problems that arise at three different stages of a job—in cost estimating and budgeting, in recording costs and measuring progress, and in computing profits.

• Costs and Budgets

The first task facing a successful bidder, who has been awarded a contract, is to prepare the most realistic budget of which he is capable. No doubt a budget was included among his original estimate work sheets, but it usually will require considerable revision since conditions often change, and new data usually become available. For example, completion of the working drawings may show that previously set material quantities, labor force levels or equipment requirements must be altered. Also costs may have been incurred since the job was estimated, which must be included, such as the cost of making the estimate itself. Items may have been overlooked, which must now be included. And frequently changes in design are made, and it is necessary to differentiate between those which resulted from actions of the owner and can be charged to him, and those which must be absorbed in the original contract.

The important point is that the budget must reflect existing conditions wherever possible since in many cases they may have already reduced the planned-for margin of profit. The sooner and more accurately the contractor knows what he is up against, the better chance he will have of regaining any sums he has already lost by error or at the negotiating table.

The principal factors which must be considered in setting up the budget include the completion period, labor productivity, methods and equipment, contingencies, catastrophe losses and a reserve for meeting post-contract costs.

The **completion period** must be honestly faced, and estimates made as to

the Red?

how many men will be involved on the job site during various phases of the work, what shift differentials will be necessary and how much overtime will be required. Appropriate cost factors must then be developed to reflect these anticipated operating conditions.

Labor productivity, as estimated should be reviewed to be sure that the rates which are set accurately reflect the performance of the various crafts in the given geographical area. For those phases of the work which are particularly complex or where construction is apt to be difficult, adjustments should be made in the basic productivity rates.

It is also necessary to review the **methods** to be used and the **equipment** to be employed to evaluate their effect on the labor-hour estimates. The budget should also differentiate between the equipment owned by the contractor and that to be rented, with particular attention given to freight costs for moving heavy pieces of equipment to and from the job site.

The budget must also contain realistic **contingency factors** for such items as: (a) work stoppages from slippages in the receipt of materials, from strikes, from jurisdictional disputes or from the weather; and (b) increases in material or labor costs resulting from errors in physical quantities shown on the engineering drawings, from increases in material prices or labor rates, and from any necessary rework. The allowances for these factors will in general reflect the contractor's past experience.

Losses from **catastrophes** must not be overlooked, but since it is not practical to assign an amount to cover them on each and every contract, a good procedure is to establish a company catastrophe loss reserve similar to a reserve for bad debts. The amount to be added to the reserve in any accounting period would be determined by overall company experience. Then a monthly catastrophe insurance charge should be made against each contract.

Finally a reserve similar to the catastrophe reserve should be set up for **post-contract costs**—those incurred after construction is finished such as in correcting construction defects, or in meeting any operating guarantees for the facility built—a reserve, similar to the catastrophe reserve, should be set up. Having such a reserve will permit job cost records to be closed out in a timely and efficient manner, and final profits taken on contracts in the years in which construction is completed.

• Cost Recording

A consistent method of accounting with a uniform set of cost codes adaptable for use on all contracts is a must if the contractor is to have any meaningful records for historical cost analysis or for future estimating purposes. However, compliance with the owner's accounting methods is equally essential. In many instances, the differences between the contractor's and the owner's methods are more apparent than real. Therefore, on each job, careful planning with the owner can often result in a real reduction in the expense of maintaining extra cost records which otherwise must be kept by the contractor.

With this problem settled the contractor is ready to tackle his specific task of cost recording, and **proper labor reporting** should be one of the first objective. With thousands of labor codes involved, the potential for misclassification of reported labor hours is extremely high. And errors in reporting labor costs to any given date not only distort the current picture, but also can lead to serious errors in projections of future costs. In some cases, the individual laborer can be relied upon to report his time accurately, while in other cases foremen or independent time checkers must be used. The contractor must carefully size up the situation on each contract and select that method or combination of methods which gives him the greatest assurance of correctly reported labor hours.

Another cost recording problem occurs where **rental charges for the contractor's own equipment** are made against the job. Here care must be exercised to prevent units, which are on site, but not in use, from being charged to the contract. This situation usually arises either because the equipment was shipped to the site ahead of the required date, or because the work for which it was needed has been completed, but shipment off site has not taken place. In either case, charges for these idle periods not only overstate contract costs, but also create errors in equipment use records and provide misleading data for future estimating purposes.

Throughout the contract, **changes or alterations** to the job become necessary, and work must proceed before the responsibility for the costs of such changes, as between the contractor and the owner, have been determined. Control techniques must therefore be instituted to flag such situations. Likewise, provisions must be made for the temporary segregation of such costs, and for their later transfer to the regular job cost codes when cost responsibility has been determined.

Recording costs for **extra work outside the original contract** also requires

(*Continued on page 304*)

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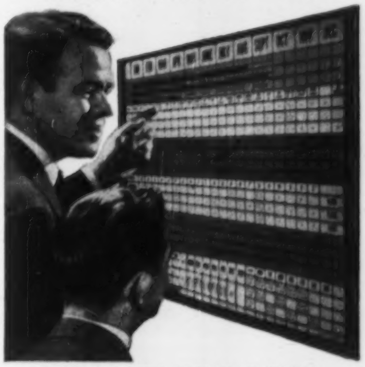

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(*Continued from page* 303)

special attention. Quite often this work is performed on a cost plus fee basis, even though the main contract is lump sum. In this case, separate accounts must be established for this outside work to insure proper segregation of costs and determination of profits. Field personnel must also be made aware of the identity of such work so as not to include it in their measurement of progress on the main contract. It is also important to have an understanding with the owner as to how field supervisory wages, field office expenses and other expenses of an overhead nature are to be allocated between the main contract and any outside work undertaken. And finally, if significant amounts of overtime or shift differential will result on the main contract as a result of the additional outside work, provision must be made for the transfer of an appropriate portion of such costs to this work.

Regardless of the treatment of these costs, as called for under the contract, field accounting techniques must permit proper allocations to be made, otherwise the reported profits will be distorted as between the main contract and the extra outside work.

Another special problem is encountered in accounting for **rework.** While rework costs are of course chargeable against the contract, good control requires that all significant rework be properly authorized, responsibility be acknowledged, and costs segregated until such work is completed and the total amount is known. Inclusion of rework in the regular cost codes without identification may destroy the utility of such codes for use in future estimating. (Rework as a result of catastropes is another category, and should be charged to to the catastrophe reserve.)

• Measuring Progress To Determine Profits

Accurate measurement of progress and realistic prediction of future costs are unquestionably two of the foundations upon which the percentage of completion method of accounting rests. The major problems encountered are:

(a) The identification of physical units with their costs at the date of the progress measurement, for unless such an identification is made, realistic predictions of total job costs will not be possible.

(b) The determination of the amounts to be added to the predicted costs to protect against budget overruns, and thus to provide a more realistic estimate of the total costs which will be incurred, and the final profit which will be earned.

An accurate determination of periodic profits is the real goal of the percentage of completion method of accounting. Thus it is important to note that significant distortions in reporting realized income can result if a uniform rate of earning is assumed over all elements of the contract, or if the method of computing the percentage of completion does not reflect actual physical progress. To illustrate how widely the realized income figures on a long-term contract can vary at the end of any given year, depending on the profit determination method employed, assume this set of simplified circumstances:

A contractor is required to construct a piping control station for directing the flow of fluids in a chemical plant. His original cost estimate upon which he was awarded the contract, and his final budget figures are as follows:

	Original Estimate			General Budget	
	Cost Estimate	Profit Estimated in Bid	Price of Contract	Revised Budgeted Costs	Revised Estimated Profit
Earthwork	$500,000	$55,000	$555,000	$550,000	$5,000
Foundations	600,000	60,000	660,000	600,000	60,000
Piping	800,000	80,000	880,000	820,000	60,000
Structures	600,000	75,000	675,000	600,000	75,000
Total	$2,500,000	$270,000	$2,770,000	$2,570,000	$200,000

At the end of the current fiscal year, the following conditions prevailed. (a) The entire earthwork has been completed at a cost of $600,000. In addition foundation materials have been purchased at a cost of $300,000, so that the total cash outlay has been $900,000.

(b) While no other work has been started, it is felt that the budgeted costs for foundations, piping and structures, totaling $2,020,000, will be met. Adding to this the $600,000 cost for excavation, gives $2,620,000 as the total forseeable cost of the job. Subtracting this from the contract price of $2,770,000 leaves $150,000 as the estimated total profit to be earned, or $50,000 less than was budgeted and $120,000 less than was originally estimated in setting the contract price.

(c) The contractor has billed the full contract price for the earthwork ($555,000) and a 25% advance on the foundation work ($165,000) so that billings total $720,000.

(d) The contract must be completed within 18 months of its starting date, and three months have already expired.

Now, from an examination of the accompanying profit determination schedule, let us see what realized profits would be reported on the above contract at the end of the fiscal year under each of five commonly employed methods of profit determination.

In every one of these methods, except the last, a profit results from the computation. In the last method, a loss of $45,000 is shown and a simple examination of the facts leaves little question as to its validity since the contractor has completed the earthwork portion of the contract for which he is to receive $555,000 but upon which his costs have been $600,000. Regardless of what he may do on the balance of the contract, he has obviously sustained a loss up to this point in the work.

In each of the first four methods at least one of the two principles mentioned earlier were violated. Either the percentage of completion did not reflect actual progress toward physical completion or a uniform rate of earnings over the entire contract was assumed.

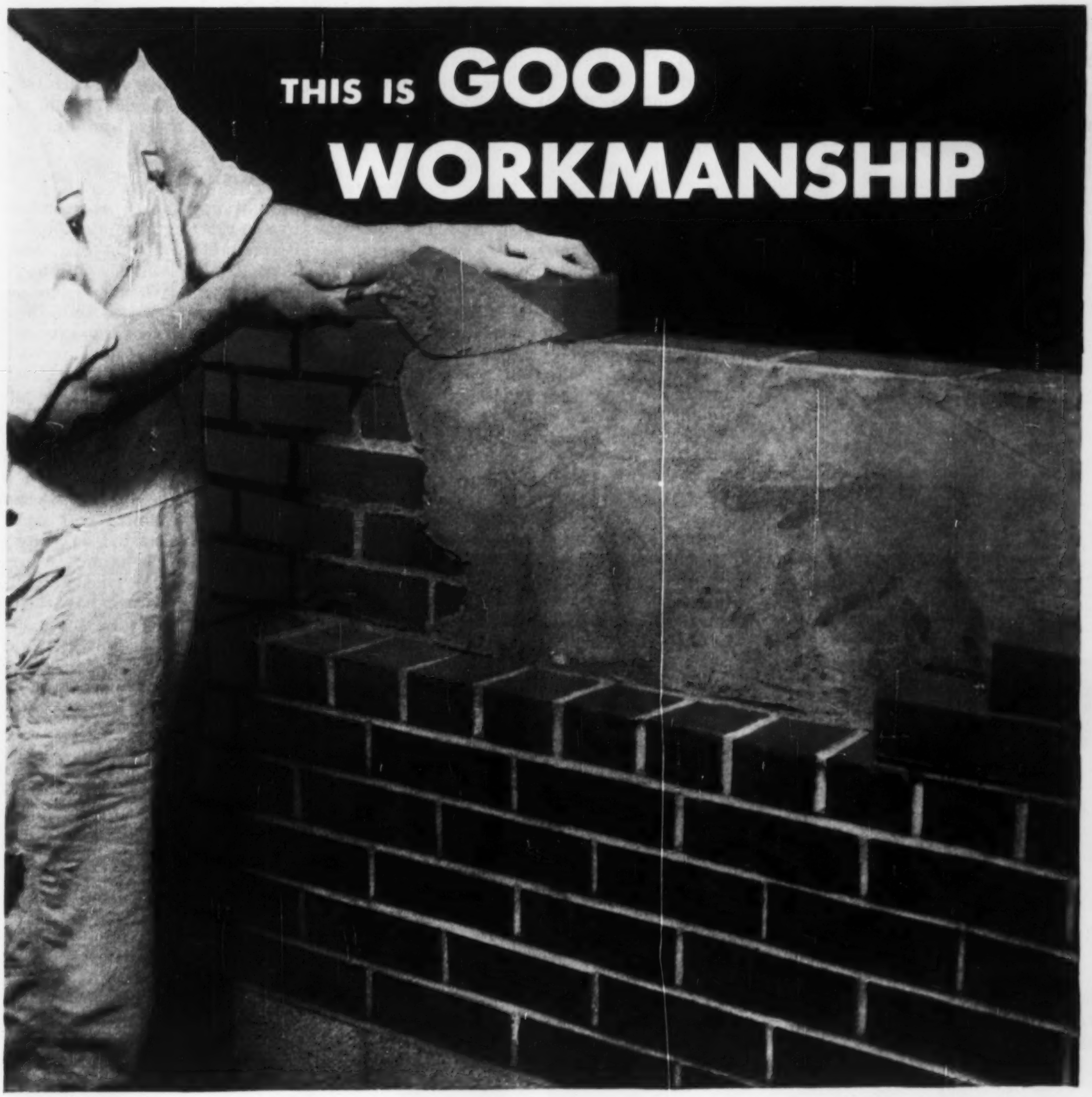
One way of analyzing the misstatements which result from the violation of these two principles under each of these methods is set forth below:

				Portion Due to:	
	Actual Realized Loss	Computed Realized Income	Total Mis-statement	Failure to Reflect Physical Progress	Use of Uniform Rate of Earning
1. Cost Incurred	$45,000	$52,000	$97,000	$22,000	$75,000
2. Bills Rendered	45,000	39,000	84,000	9,000	75,000
3. Elapsed Time	45,000	25,000	70,000	($5,000)	75,000
4. Physical Compl. Contract as a Unit	45,000	30,000	75,000	0	75,000

The first two methods produced a higher percentage of completion than the actual physical progress because amounts of costs and billings, which had no relationship to the work completed, were included in the numerator of the completion ratio. The third method produced a lower percentage of completion than that reflected by actual physical progress because the earthwork was completed in less than its pro rata portion of the total contract time.

Of greater significance, however, is the fact that regardless of how the percentage of completion was determined, a material misstatement of income would still have resulted under these

(*Continued on page* 306)



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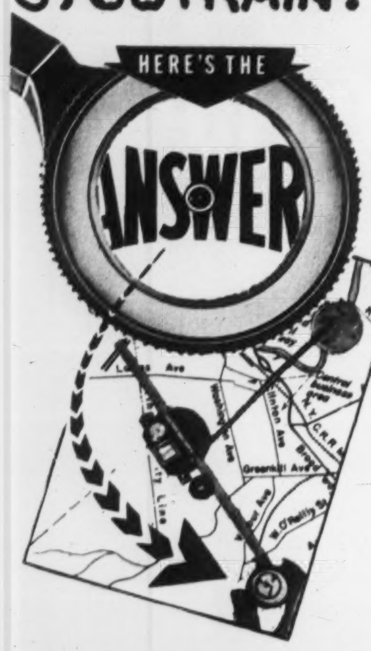

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(Continued from page 304)

methods because of their assumption of a uniform rate of earnings over the entire contract. Under this concept an averaging feature is introduced into the profit computation. Accordingly, whenever the total estimated profit or status of completion of the various work segments differs significantly from the averages for the contract as a whole, any method which assumes a uniform rate of earnings indicated can produce a significant error at any given stage of completion in the realized income amount.

It is recognized that in some instances there are difficulties involved in identifying the various elements of work in the contract price against which to match the related costs. However, when it is remembered that in most cases the contractor has developed his cost estimate on the basis of significant segments or units of the total work to be performed, the problem of prorating the contract price against these segments becomes less formidable.

In those cases where different profit percentages have been applied to various elements of the work in establishing the contract price, the requirements to determine realized income on each of these elements individually would appear to be mandatory if the conventional accounting principle of matching income and expense to derive profits is not to be violated.

It is not unreasonable to assume that accountants are probably largely responsible for the development of many of the present day methods of profit determination which are based entirely on accounting figures. Perhaps they have been willing to accept the imperfections of these methods rather than to surrender their prerogatives in the area of profit determination to engineers. The accountants' position may well have evolved from a feeling that they are not in a position to evaluate the techniques employed by engineers in measuring physical progress.

As an accountant, I believe this feeling should not exist. The methods employed by engineers in measuring progress usually follow a normal, logical, step-by-step pattern which most accountants will find relatively easy to understand. With a little experience, the accountant should have no difficulty in verifying the reasonableness of progress reported by engineering methods for use in developing realized income amounts on long-term contracts.

In fact, only in those instances where realistic engineering or architectural estimates of completion are not available would any other basis of measuring progress appear to be justified. In such instances, it would seem that the cost incurred method, with adjustments made for rework costs and costs of a preparatory nature, would provide the best indication of realized profits.

• Conclusions

While the problems which confront the large contracting firm in accounting for interim profits on long-term, lump sum contracts are complex in the extreme, they are not without solution. Some contractors have faced up to these problems and have solved them successfully. Unquestionably, the approach must be carefully tailored to meet each individual situation. However, a few of the more important steps which the author has seen undertaken with a considerable degree of success are set forth below:

The development of a standard chart of accounts and uniform cost codes which are adaptable for use on all projects regardless of their nature.

The development of efficient techniques to provide for exceptions to the regular method of accounting when special cost records are required by the owner.

The implementation of a practice wherein accounting personnel participate in contract negotiations to explain the contractor's standard method of accounting to the owner and to negotiate the owner's acceptance of this method.

The adoption of a policy under which the contract negotiating team is called upon to negotiate the incorporation of any outside extra work into the basic contract, wherever such treatment will be equitable to both owner and contractor. This has resulted in including a much greater percentage of the total work under the main contract, thus simplifying the recording of costs, the measurement of progress and the reporting of interim profits.

The development of estimating procedures which combine the use of historical cost records and engineering analyses of the work to be done, to produce realistic construction budgets. Where budgets are developed in this way they reflect the particular methods to be used, any regional labor productivity factors, unusual equipment requirements, and any other special cost aspects which are unique to the contract at hand.

The establishment of pre-field planning meetings with construction personnel to review construction methods, proposed schedules, anticipated manpower and equipment requirements, etc. Acceptance of operating budgets by the people who will be required to meet them usually result from these meetings. Without such acceptance,

(Continued on page 308)

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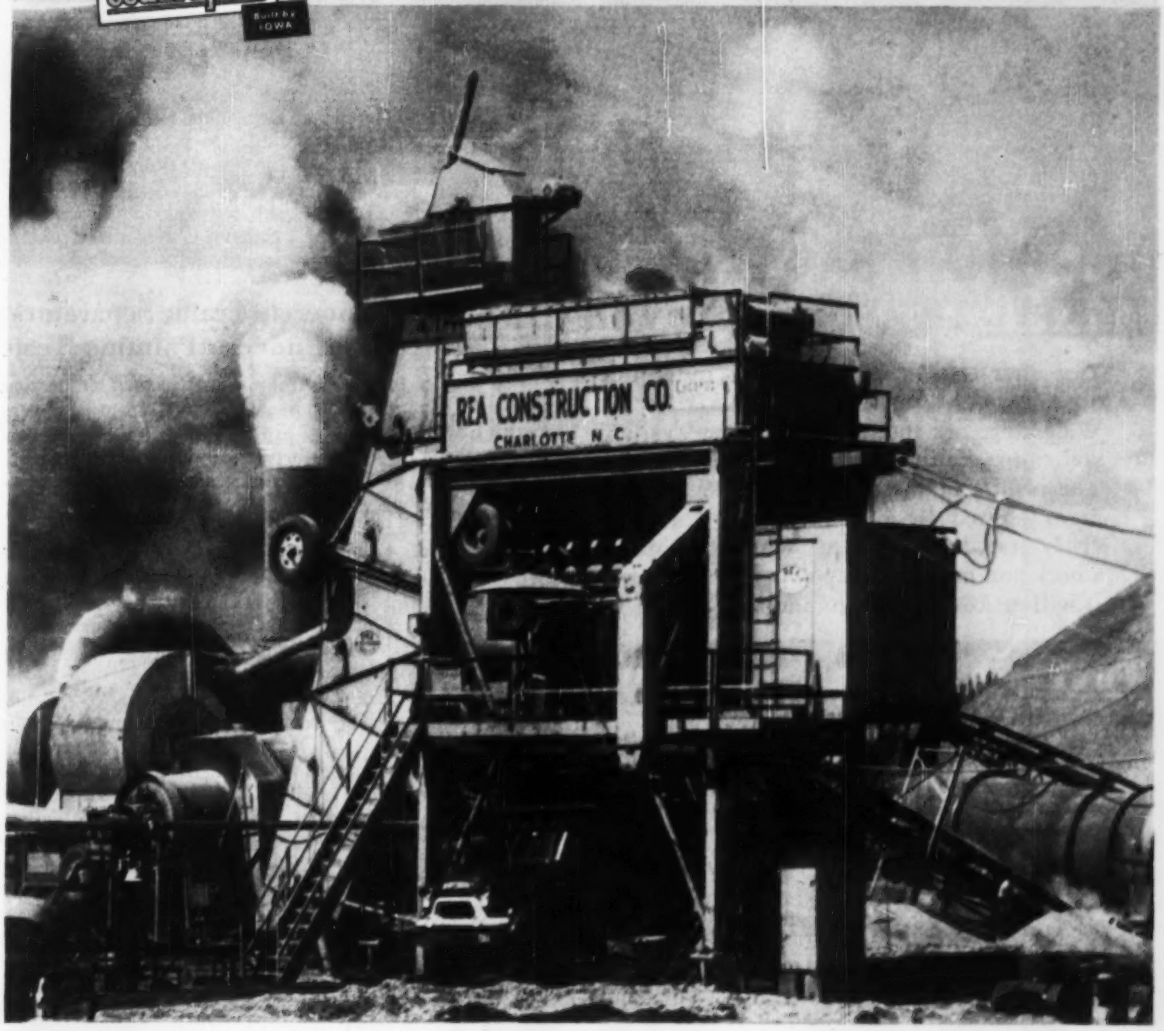

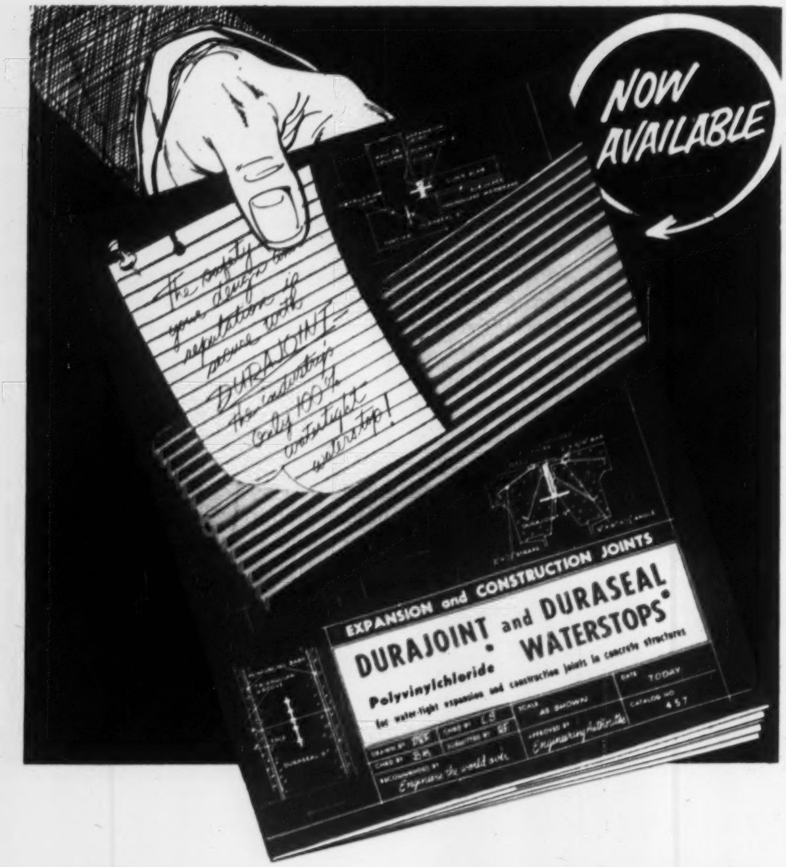
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(Continued from page 306)

budgets are largely meaningless as tools for control.

The development of procedures for the proper and timely adjustment of budgets to reflect all changes in the contract.

The development of procedures for the realistic establishment of contingency factors and reserves for catastrophe losses.

The development of procedures for the determination of periodic realized profits which reflect actual physical progress toward completion of each significant work element of the contract.

The establishment of procedures for the reporting and analysis of differences between actual performance and budgets.

The establishment of a sound operating report structure to provide each level of management with needed information for control.

The establishment of procedures to permit the timely close-out of job accounting records upon the completion of contracts.

In summary, it would seem that owners as well as contractors are responsible for the slow progress which has been made in developing the necessary control techniques to permit effective use of the percentage of completion method of accounting on lump sum contracts. It also seems fair to venture that both groups have been, and still are, paying a princely sum for this indolence.

Concrete Traffic Separators To Undergo Painting Tests

The California Highway Commission has allocated $15,000 for the experimental painting of two traffic separation structures on the West Sacramento Freeway—the Jefferson Boulevard Separation and the Westacre Road Undercrossing.

The project is intended to test the practicability of coloring concrete structures on the state highway system in order to improve appearance and to make them blend with surrounding terrain or architecture.

The Jefferson Boulevard Separation will be colored with a concrete stain—the lower section dark brown, the upper part a light green. Paint will be used on the Westacre Road Undercrossing and the color scheme will be reversed.

Different types of coloring are being used on the two structures so that the comparative cost, appearance and ease of application of each method can be evaluated. Afterwards, the structures will be kept under observation to determine durability of each type of coloring.

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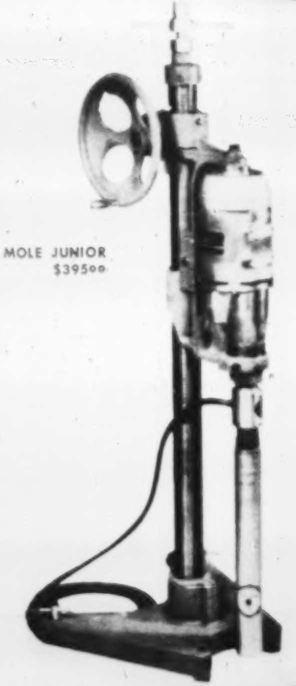

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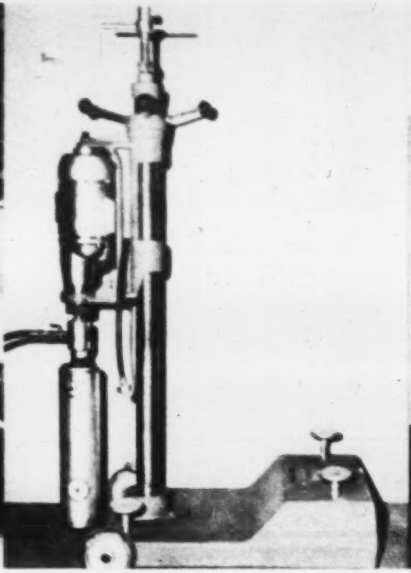
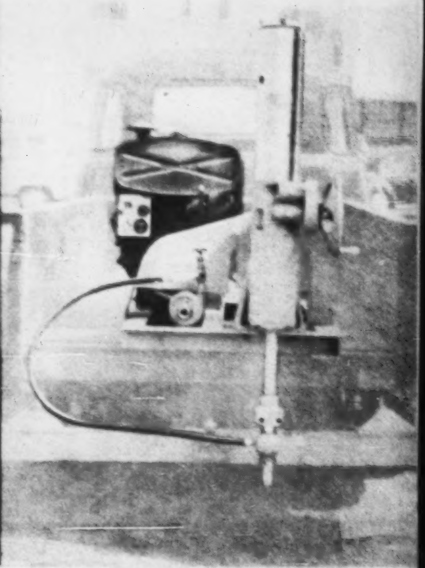
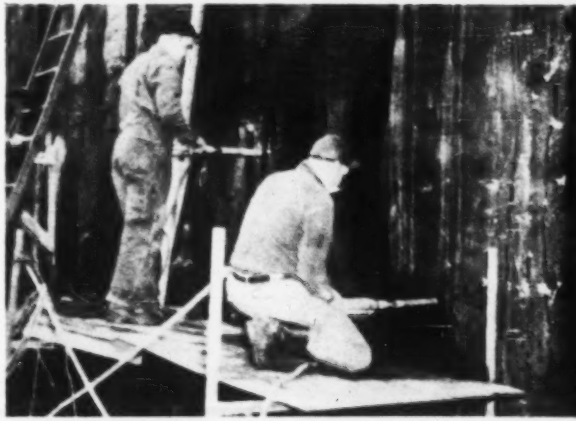


The Mole Junior uses a 1¼" 110 volt B&D drill. Vertical or horizontal use.

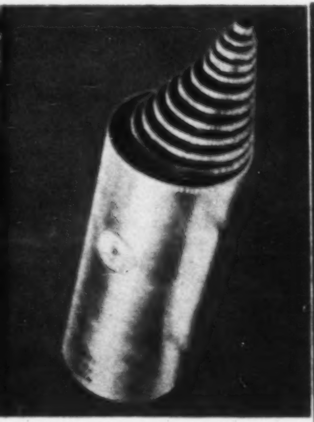
Model V — for drilling deep holes vertical or horizontal from 1" diameter to 14" diameter.



Model V machine equipped with 15 H.P. Wisconsin engine for drilling shallow or deep holes, will drill down to 50 feet in concrete from 1" to 14" in diameter.



Hand held drilling equipment drills brick or tile and small holes in concrete.



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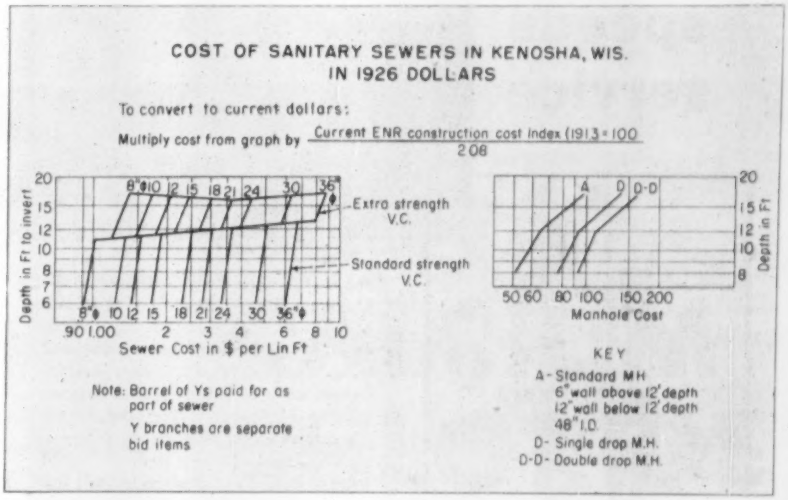
Using median bid prices, here's a method of constructing . . .

Do-It-Yourself Sewer Cost Graphs

Benjamin C. Seal
City Engineer
Kenosha, Wis.

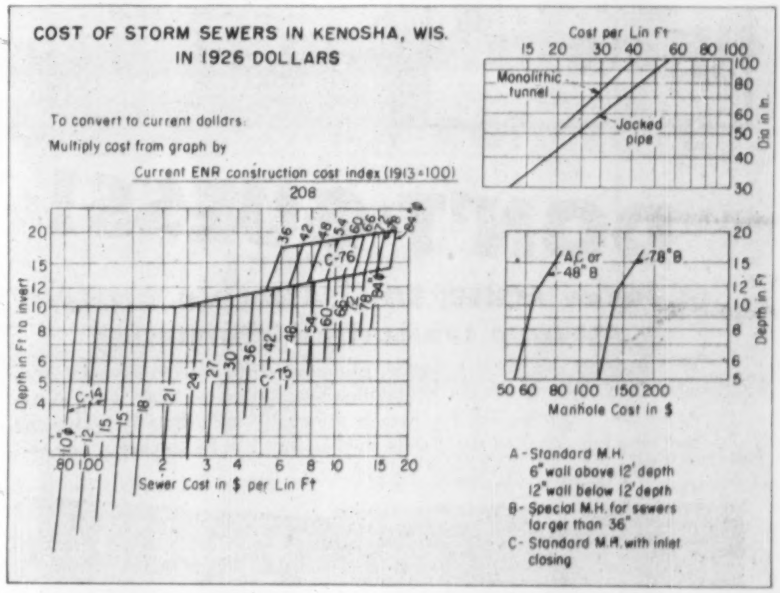

COST OF SANITARY SEWERS IN KENOSHA, WIS. IN 1926 DOLLARS

To convert to current dollars:
Multiply cost from graph by $\frac{\text{Current ENR construction cost index (1913 = 100)}}{208}$

Note: Barrel of Ys paid for as part of sewer
Y branches are separate bid items

KEY
A - Standard MH 6" wall above 12' depth 12" wall below 12' depth 48" I.D.
D - Single drop M.H.
D-D - Double drop M.H.

FOR SANITARY SEWERS: Limit of data used in graphs is local bid experience.


COST OF STORM SEWERS IN KENOSHA, WIS. IN 1926 DOLLARS

To convert to current dollars:
Multiply cost from graph by $\frac{\text{Current ENR construction cost index (1913 = 100)}}{208}$

A - Standard M.H. 6" wall above 12' depth 12" wall below 12' depth
B - Special M.H. for sewers larger than 36"
C - Standard M.H. with inlet closing

FOR STORM SEWERS: Similar graphs can be constructed for any locality.

A very handy set of graphs of sewer cost experience has been developed by the author for the area with which he is concerned. Based on actual sewer project bids, the graphs supply quick and fairly reliable cost estimates and are of considerable use in analyzing bids. In particular, they help answer the common questions of whether to build a deep small sewer or a shallow large one, whether to cradle or to use heavier pipe, and where to locate manholes.

The methods used to construct the graphs are applicable to almost any location. Only "straight" jobs in Kenosha were included, jobs requiring no breaking of pavement, rock excavation nor sheeting, and an average amount of water pumping. Soil conditions in the area vary from a hard blue clay overlain with 10 ft of running sand to firm yellow clay for the entire trench depth; no account of soil differences was taken.

For the jobs included, unit prices for the various pipe sizes and trench depths bid by the median bidder are employed (the prices bid by the contractor having the total median bid).

• Adjust with index—These prices are adjusted to base year dollars by use of the ENR Construction Cost Index at the time bids were taken. The author happens to employ the 1926-100 index, which has not been published by ENGINEERING NEWS-RECORD in some time.

With all the data in constant dollars, the graphs are constructed simply by plotting cost against depth to invert for various sizes and types of sewers on log-log paper. The actual plot is the best fitting line for each size of sewer.

Experience has shown the author that cost of a sewer increases with depth in accordance with some exponential law.

It should be noted that the sewer costs in the illustrated graphs are on a 1926 basis and can be converted to current dollars by multiplying (a) by the current ENR Construction Cost Index (1926-100) over 100; (b) by the current Index (1913-100) over 208; or (c) by the current Index (1949-100) over 44.

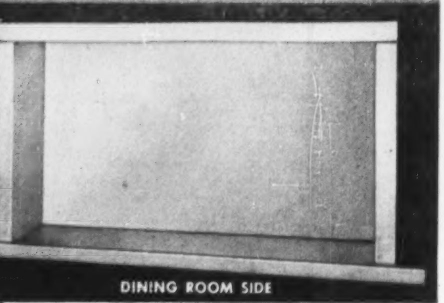
Using the method presented above for charting sewer bids, any estimator with a few records can predict sewer costs within the scope of his records. An indication of the reliability of the Kenosha graphs is contained in the accompanying set of unit prices bid recently. Note that the low and high bids (of six bids submitted) are tabulated and how frequently the author's estimate splits the difference in the high-low range.

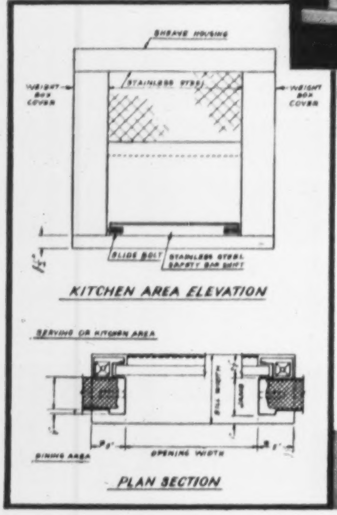
• To construct your own—Although the author used the 1926 = 100 ENR construction cost index, others may find it simpler to construct graphs for their own areas using either the 1913 = 100 or the 1949 = 100 indexes, both of which are currently published by ENR. Unit prices can be converted to base year dollars simply by dividing the price by 1/100 of the construction cost index at the time the price was bid. After the graphs are constructed, cost data obtained from them may be updated to current dollars by multiplying by 1/100 of the current index value for the same base year as was used in constructing the graphs.

(Continued on page 312)

RICHMOND PASS WINDOW

speeds service





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(Continued from page 311)

The graphs should not be constructed with old data (data that are more than three years old) due to constantly increasing productivity. The data illustrated were developed from jobs bid from 1954 and 1956 inclusive. The author also has found it unwise to extend the graphs beyond the range of records; cost of a 30 in. pipe cannot be estimated reliably based on records ranging between 8 in. and 24 in. sizes.

—Bids Prove Graphs—

Storm and sanitary sewers ranging from 6 in. to 60 for Kenosha, Wis., include almost 3,000 lin ft of tunnel section. This tunnel is 60 in. in diameter in plain concrete casing of hexangular outside cross section with minimum wall thickness of 12 in.

Reconstructing catch basins involves plugging outlet to old sewer and partially filling with class D concrete.

Wage rates run from $2.65 for common labor, $3.00 to $3.30 for semiskilled to $3.10 to $3.48 per hour for skilled workers.

Bidders included:

1C	Kenwal Construction Co., Kenosha, Wis	$342,531
6	Santucci Construction Co., Skokie, Ill	624,817
EE	Benjamin C. Seal, City Engineer, Kenosha, Wis	344,625

Bids: 6-11-57 Items	Aver Depth	Unit	Quantity	Unit Prices EE	1C	6
CP, C-76II, 60"	21	lf	1,817	$46 80	$52 30	$75 00
Tunnel, 60"		lf	2,990	85 00	78 80	159 00
MH, B (over 48")	21	ea	6	500 00	1,200	1,250
CMP, bit ctd 18"		lf	30	7 00	15 00	20 00
15"		lf	36	6 00	6 00	15 00
10"		lf	16	5 00	5 50	13 00
8"		lf	86	4 00	4 60	14 00
Flap gate, 18"		ea	1	100 00	250 00	280 00
RCB		ea	3	50 00	50 00	150 00
Stone cradle		t	200	3 50	4 25	3 00
Concrete, cl D		cy	260	20 00	25 00	25 00
Backfill, sand		cy	2,000	2 00	2 50	2 50
Inlet structure		ea	1	1,000	1,500	5,500

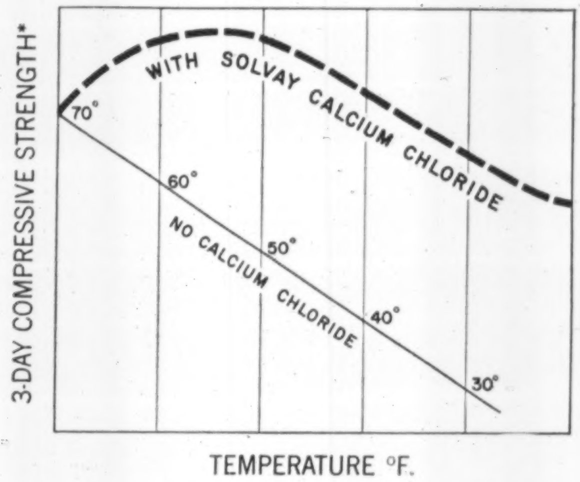
Completion schedule: 7-1-57 to 1-1-58
Liquidated damages: $15 per day

1C	D. Tirabassi & Sons, Kenosha, Wis	$83,185
4	Pietro Scalzitti, Chicago, Ill	139,274
EE	Benjamin C. Seal, City Engineer, Kenosha	115,414

Bids: 6-10-57 Items	Aver Depth	Unit	Quantity	Unit Prices EE	1C	4
CP, C-7611, 54"	18 5	lf	60	$39 00	$23 60	$65 00
1, 36"	8 5	lf	330	17 80	11 10	24 50
30"	12 2	lf	200	15 20	8 50	15 00
C-75, 30"	9 0	lf	670	13 50	8 20	14 00
C-781, 27"	11 3	lf	275	12 40	7 35	12 85
C-75 27"	7 3	lf	675	11 70	6 75	11 75
24"	9 8	lf	300	10 00	6 05	9 70
21"	7 6	lf	925	7 80	5 35	8 70
18"	8 1	lf	1,820	6 20	4 80	7 70
15"	5 2	lf	275	5 00	4 35	6 65
C-14, 12"	8 6	lf	550	3 85	3 00	4 25
10"	8 3	lf	400	3 10	2 75	3 50
VC, ES 18;	16 1	lf	1,390	11 70	6 50	11 75
8"	12 8	lf	2,275	4 40	3 44	6 10
VC, std 8"	8 8	lf	1,400	3 40	2 69	4 85
6"		lf	85	2 00	2 46	4 00
CMP, bit ctd 15"		lf	12	5 50	4 55	6 00
10"		lf	32	4 00	3 86	5 00
8"		lf	950	3 50	3 60	4 20
CIP 8" cl 50		lf	26	10 00	5 00	9 00
Y 6"		ea	135	4 50	4 66	3 00
MH 1-X (special)	18 5	ea	1	500 00	250 00	700 00
B (over 48")	18 5	ea	1	325 00	450 00	500 00
A san (std blk)	11 8	ea	23	220 00	185 00	240 00
A storm (std blk)	7 2	ea	26	200 00	160 00	240 00
CB, reconstruct		ea	2	45 00	60 00	100 00
Inlets		ea	23	90 00	95 00	120 00
Lower san sew hous		ea	5	100 00	60 00	100 00
Rem exist culv, repl with CMP 24"		ls	job	1,300	400 00	1,500
Flap gate, 15"		ea	1	100 00	75 00	150 00
Backfill, sand		cy	2,000	2 00	1 50	4 00
Conc cradle, cl D		cy	200	20 00	20 00	26 00
cr stone		t	200	3 50	2 50	5 00

Completion schedule: 7-1-57 to 1-1-58
Liquidated damages: $15 per day

HERE'S PROOF!



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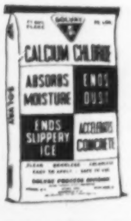

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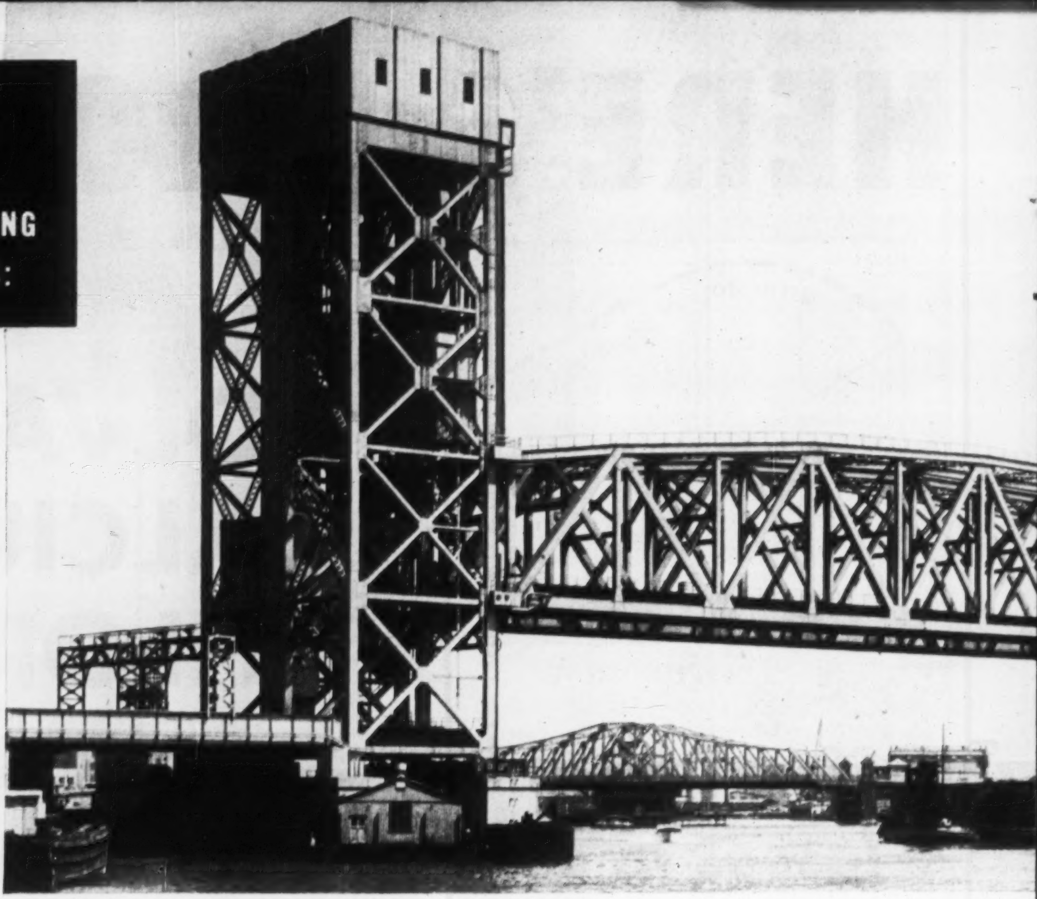
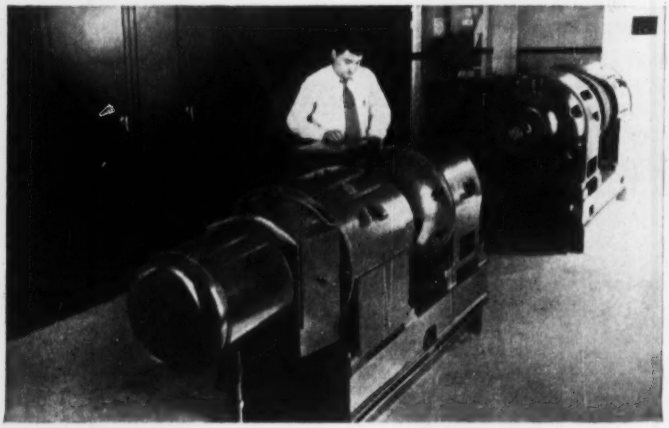


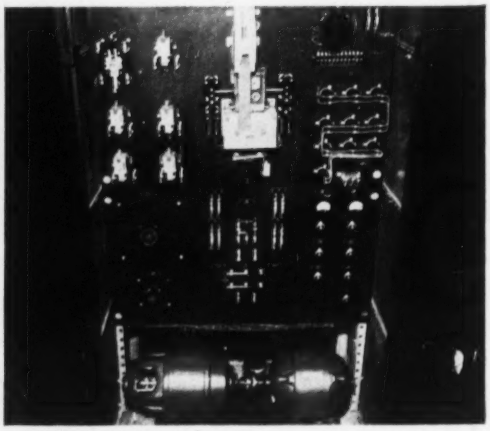
500 TRAINS A DAY roll over New York Central System's new Harlem River lift bridge in New York City. Reliable General Electric *amplidyne-controlled* system permits balancing of loads between tower drives. These tower drives provide accurate alignment of spans while moving and during seating.

Powered by reliable G-E amplidyne drive system . . .

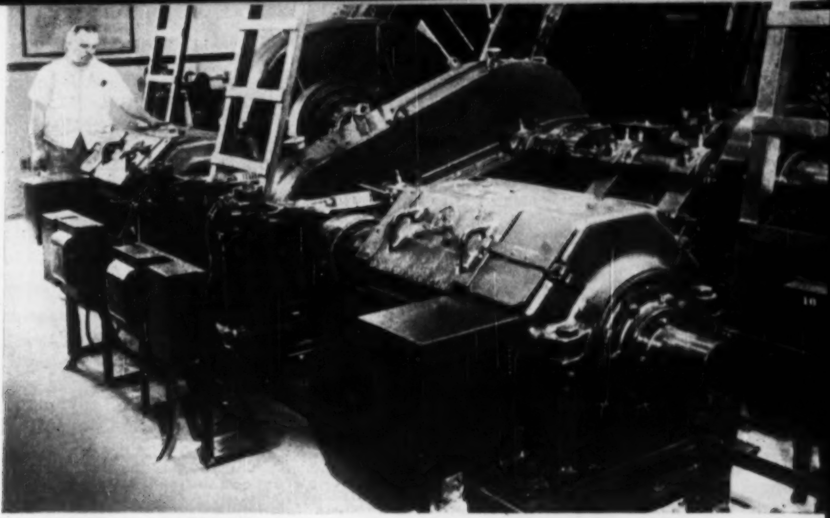
Vital N. Y. Central lift bridge carries 500



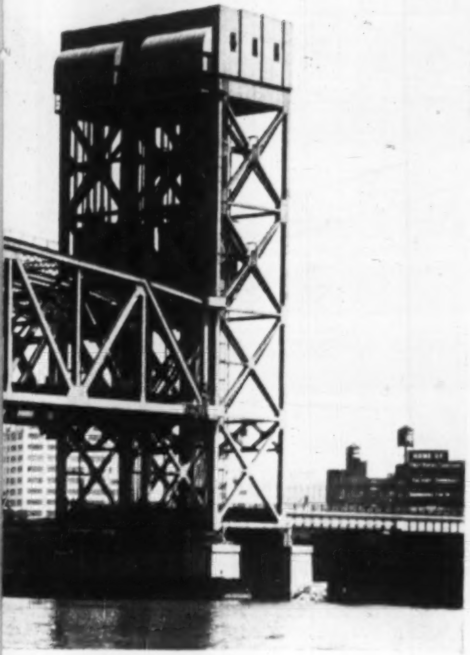
EMERGENCY POWER is provided by 50-kw G-E motor-generator set (foreground) and a small submarine cable tied to two power sources. Main General Electric motor-generator installation (rear) is rated 150-kw, supplies d-c power to drive motors. Continuous circuit adjustment helps reduce stresses on machinery, cables, and lengthens drive equipment life.

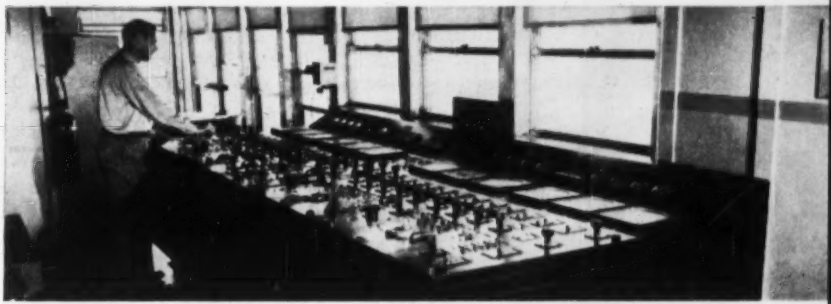


INSTANT RESPONSE and high amplification factor are two *amplidyne* features that help provide pin-point control of motor speed, torque output regardless of load variations. Built-in characteristics enable *amplidyne* to deliver reliable performance over long periods.



RUGGED 230-HP D-C DRIVE MOTORS raise two 1600-ton spans 110 feet within 90 seconds! Flexibility, reliability features of d-c motor, plus ***amplidyne's*** instant response and high amplification factor help provide maximum torque output quickly, smoothly.





PRECISE CONTROL of all bridge operations—lifting, lowering, seating—is centralized in a General Electric equipped master control station. Two separate power sources, one on each side of the Harlem River, are utilized to drive the bridge's span lifting mechanisms.

trains a day across busy Harlem River

General Electric equipment raises, lowers, seats two 1600-ton spans rapidly, smoothly, without rebound

New York Central operates 11,000 miles of railroad, providing fast, efficient service from the Atlantic Seaboard to the Mississippi Valley. Mainstay of this route structure is Central's main artery into the heartland of the Midwest.

VITAL LINK for passenger train service in this artery is a new 14,000-ton double lift bridge over the Harlem River in New York City. One of N.Y. Central's heavily-trafficked track sections, this bridge carries 500 commuter, through trains daily, plus switching operations. The busy waterway below handles heavy barge, freighter traffic.

FOR ALL-WEATHER OPERATION, a G-E amplidyne-controlled drive system was selected for fast, precisely-controlled lift performance. This system, applied to key bridges since 1949, raises two 1600-ton spans 110 feet within 90 seconds, and lowers, seats them smoothly, without rebound. The amplidyne's high amplification, instant-response features enable rugged G-E d-c drive motors to deliver smooth, peak performance regardless of load variations.

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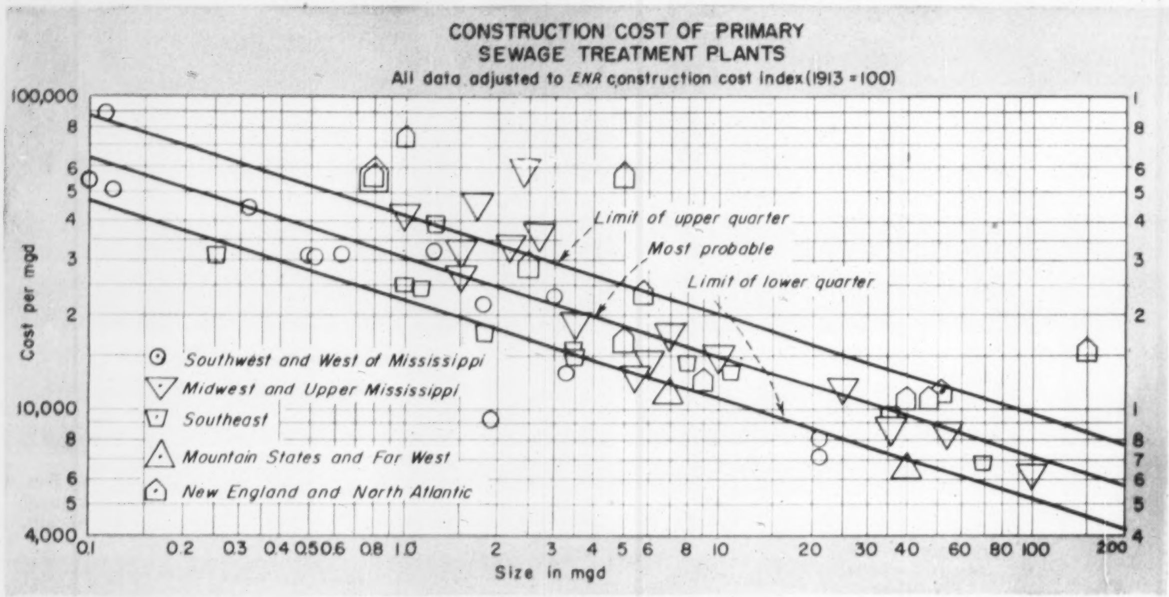


PRIMARY PLANT estimating curves are good for plants of approximately 35% BOD removal.

New Guide to Sewage Plant Costs

In an effort to update the widely used cost yardstick prepared by Prof. C. J. Velz for ENGINEERING NEWS-RECORD nine years ago, ENR gathered current data and asked the author to analyze them. Mr. Diachishin found that sewage plant costs have decreased 30% since 1948 (on a base year dollar basis) and that the changing picture deemed it advisable to present Velz-type estimating curves in a different, and incidentally simpler, manner.

Alex N. Diachishin
Consulting Engineer
Bergenfield, N. J.

Sewage treatment plant costs have decreased approximately 30% since 1948—using figures adjusted to a base year with the ENR Construction Cost Index. This is the most striking conclusion from recent construction cost data gathered by ENR, from which the author has prepared estimating curves for primary and secondary facilities.

Cost information for treatment plants constructed since 1947 came from consulting engineers all over the country. Costs are for treatment plants only, including sludge handling facilities but excluding interceptors, outfalls, land acquisition, site development, engineering, legal, interest and pump stations.

Number and locations of plant data used in the analysis are shown in the table. No intermediate (chemical coagulation) plants were included because the number reported in the survey was deemed statistically insufficient.

Data analyzed by Prof. C. J. Velz (now at the University of Michigan) for his widely used yardstick (ENR Oct. 14, 1948 p. 84) included all types of plants adjusted to a single estimating curve. The Velz curve is based on 100% BOD removal. To obtain estimated costs for activated sludge, trickling filter, chemical coagulation and primary plants, base curve values are multiplied by 0.90, 0.85, 0.65 and 0.35, respectively. Thus an activated sludge plant would cost 0.90/0.35, or 2.56, times as much as a primary plant of the same capacity.

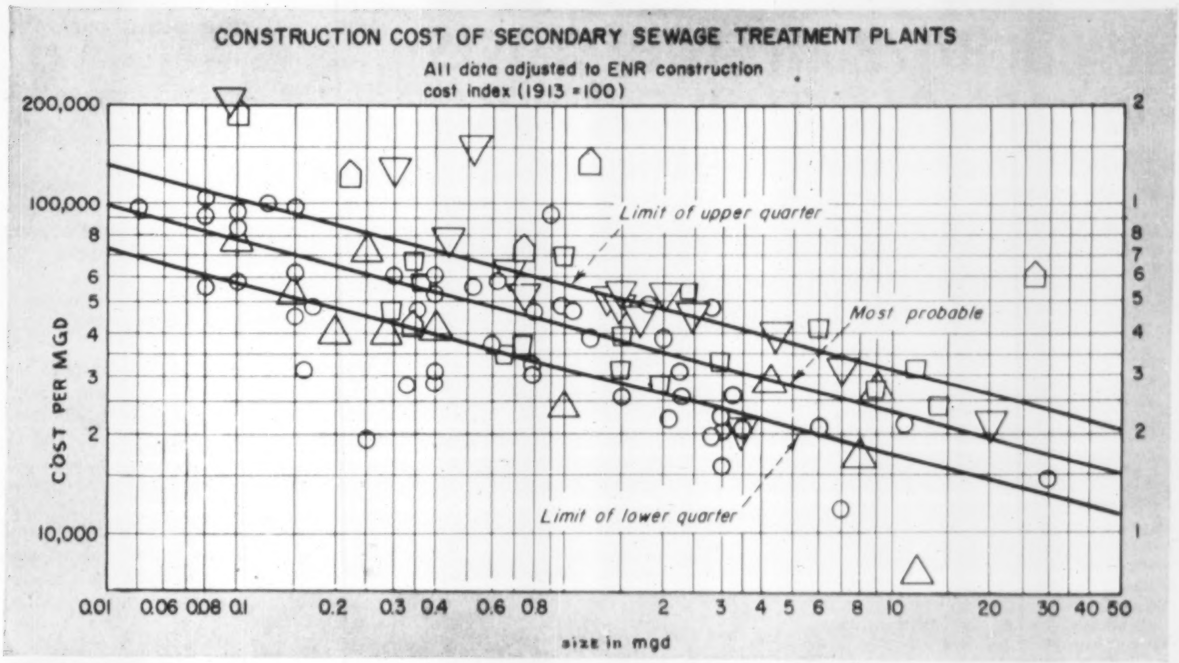
• Why two graphs—Evaluated statistically, the secondary-to-primary plant cost ratio for the 1957 survey data varied from 1.16 for 0.01 mgd plants to 1.57 for 100 mgd plants. Because of these changing ratios, separate curves were calculated for primary and secondary plants.

Initially, however, the 1957 survey data were fitted to a single base curve utilizing the Velz 100% method. Surprisingly, slope of this curve, on log paper, was almost identical to the Velz line (see small graph). But the new curve was displaced downward from the original, such that the average cost was only 70% of the Velz costs. Correlation of the 1957 curve by the least squares method demonstrated a very good fit.

Since the methods used by Prof. Velz and the author to determine plant costs were identical, and since both cost studies represent a substantial portion of the total number of sewage treatment plants constructed, the indicated decrease in treatment plant cost must be accepted as real.

Probably one of the important reasons is increased efficiency of design. Sewage plant design, only recently in an embryonic stage, has developed such that a host of able practitioners with the help of standards and guides offered by control agencies, are turning out a better job. Secondly, there is better equipment available for many of the unit processes in a sewage treatment works. Lastly, research has developed new methods which have tended to reduce the cost of sewage treatment.

• 1957 curves—In the accompanying two larger graphs, lines of best fit are shown for primary and secondary plants. This average, or most probable, curve represents typical practice in the U. S. for post World War II years. In addition, each graph contains "quarter" curves which enclose approximately 50% of all the data points.



SECONDARY CURVES are for trickling filter and activated sludge plants. See primary graph for legend of data points.

To illustrate use of the curves, suppose that an estimate for a 1.0 mgd primary treatment plant is required at a time when the ENR Construction Cost Index (1913=100) is 700. Then in 1913 dollars, the average cost per mgd of capacity is read as $31,100. Total current estimated cost is then 1.0 x $31,100 x 7.00=$217,700. Similarly, half of the plants this size should range in cost between $158,900 (1.0 x $22,700 x 7.00) and $298,900 (1.0 x $42,700 x 7.00).

• **Regional differences**—Analysis of regional differences in total plant costs reveals the interesting data in the last column of the table which covers both primary and secondary plants. Reliability of the two 15% deviations from average is only fair to poor because of the paucity of cost data for these two regions.

There can be no doubt though that regional differences exist in the plant cost data collected for this 1957 survey. One reason, valid to some extent, is that the survey plants are not truly typical of the region since they represent a comparatively small sampling of the total number of plants that are found in the area.

Designed differences—those due to regulatory agency requirements, site peculiarities or personal preference of the designer—could account for some of regional variations in plant costs. Regulatory requirements are indeed different in many states, but in recent years there has been considerable standardization (notably the "Ten State Standards" embracing Midwestern and North Atlantic States) that have tended to minimize regional differences. Similarly it would appear that site difficulties would crop up as much in one region as in another. And although personal preferences of designers do occur, it appears unlikely they would occur on a regional basis.

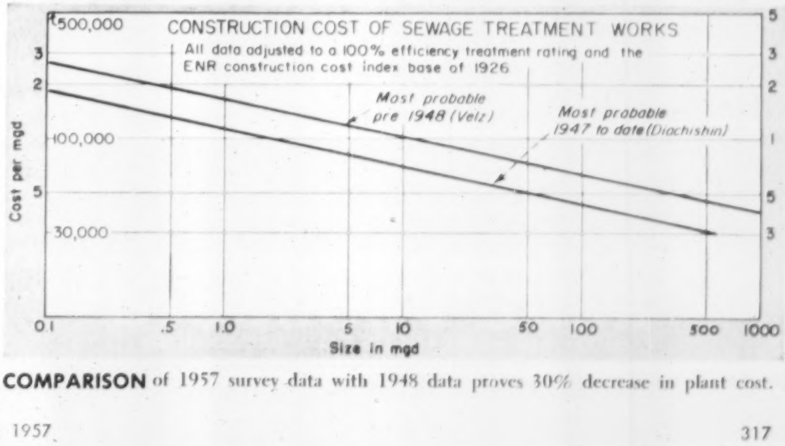
Thus, the conclusion is reached that construction differences—regional patterns in labor, material and number and type of contractors—account for most of the regional variation in costs.

According to the consultants who

Summary of Survey Data

Region*	Number Primary Plants	Number Secondary Plants	Total	% Deviation of Cost From Average
New England & North Atlantic	12	6	18	+15
Southeast	11	16	27	0
Midwest & Upper Mississippi	16	16	32	+ 5
Southwest & East of Mississippi	14	50	64	−10
Rocky Mountains & Far West	2	11	13	−15
	55	99	154	

*New England & North Atlantic: Conn., N. J., N. Y., Del., Pa., R. I.; Southeast: Va., N. C., Fla., S. C., Ga., Ala.; Midwest & Upper Mississippi: Ky., Tenn., Minn., Mich., O., Ind., Wis., Ill.; Southwest & West of Mississippi: Okla., Kan., Mo., Tex., Ark., N. D.; RockyMountain & Far West: Calif., Wyo., Ore., Wash., Colo., Ida., Mont.



COMPARISON of 1957 survey data with 1948 data proves 30% decrease in plant cost.

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. . . Sewage plant costs

(*Continued from page 317*)

forwarded cost information for this study, three major factors tend to displace costs from average values in any given region. They are: foundation conditions, know-how of contractors with respect to treatment plant construction; and the general state of competitiveness among contractors. A fourth factor, of course, is the design of the plant as affected by designers' personal preference and capability.

• **Effect of sludge handling**—Analysis of the survey data indicated that high plant costs are not attributable to high sludge handling costs, as might be assumed. Respondents to the ENR questionnaire in general included digestors, heat exchangers, sludge beds, sludge lines, vacuum filters and other related equipment, although there did appear to be some inconsistency of items included and in isolating sludge handling costwise.

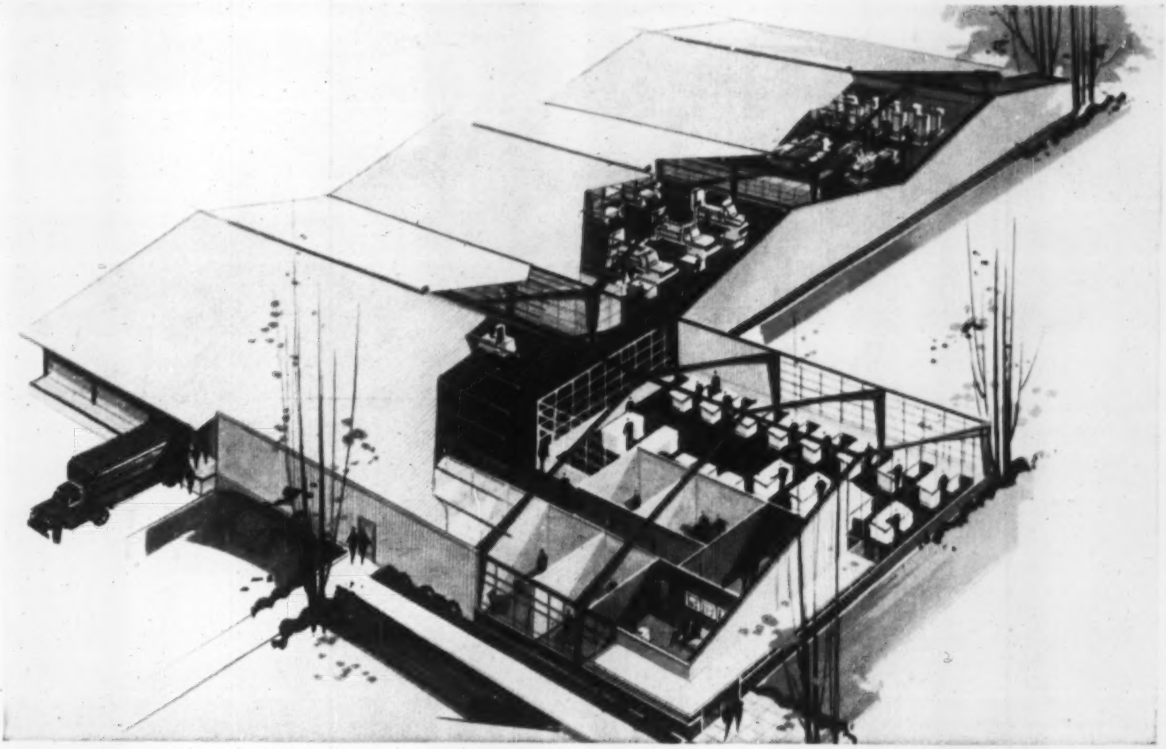
Regardless of regional location, type of disposal and size of plant, sludge handling costs for secondary plants were remarkably constant, varying only between 24 and 28% of the total costs. Survey average is 26.9%.

For primary plants, however, sludge handling facilities cost from 44% of the total cost for plants smaller than 1 mgd, 32% for plants between 1 and 10 mgd and 28% of total cost for larger plants up to 100 mgd. Survey average is 35.8%.

All these figures should be used cautiously since the differences are not statistically significant due to the small amount of survey data (on an absolute basis).

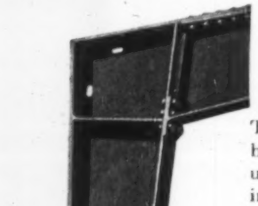
• **Graph limitations**—All of the data used in the preparation of the estimating curves were for plants treating sewage of a predominantly sanitary nature. Hence estimates from the curves for plants with a large amount of industrial wastes would be of less accuracy. And it is difficult to state whether the cost per unit of flow capacity for a predominantly industrial waste plant would be higher or lower than an equivalent capacity sanitary sewage plant.

The estimating curves presented in this article are not intended as a substitute for an engineering estimate of construction cost, nor are they intended to imply that the plot of unit cost versus hydraulic plant capacity is the only valid method of cost evaluation. However, in as much as the curves demonstrate recent practice, and define this practice within comparatively narrow bounds, it is felt that the curves offer a comparatively reliable yardstick for the estimation of sewage treatment plant cost.



Manufacturers get rugged, clear-span design, attractive *Stran-Satin* walls

with NEW STRAN-STEEL BUILDINGS



Sturdy Tapered Frame Design Puts Strength Where Needed

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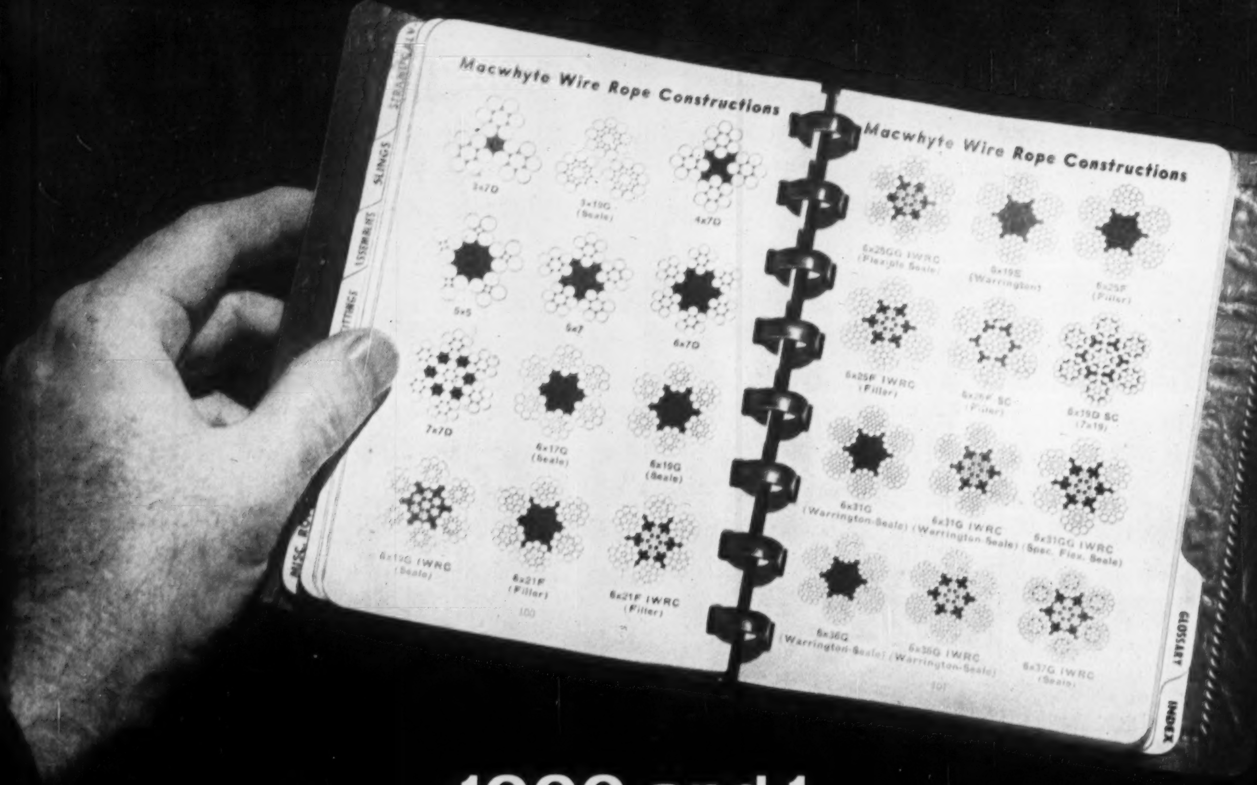
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1125

Precasting and prestressing pays off . . .

Bid Prices Are Low for Three-Mile Bridge

W. E. Dean
Assistant State Highway Engineer
State Road Department of Florida

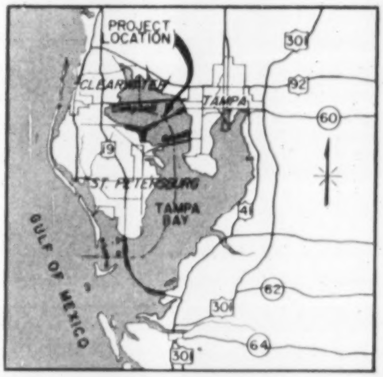
Unusually low bid prices have been received by the State Road Department of Florida for its largest single project to date under the Interstate Highway Program. The project is a 3 mile long bridge, with precast, prestressed beams, over Old Tampa Bay on a direct route between Tampa and St. Petersburg.

The bridge is the central unit in a 7 mile crossing of the bay. About four miles of the crossing, in water less than 12 ft deep, will consist of dredged-fill causeways, which will be built under a separate contract. The remainder will consist mostly of 286 identical trestle spans 48 ft long and will be over water 12 to 22 ft deep.

The bridge will accommodate four lanes of traffic. The width between curbs will be 56 ft, consisting of two 26 ft roadways and a 4 ft wide mountable median. Safety curbs 2 ft wide will be provided on each side. Thus, there will be a clear width between inside faces of handrail of 60 ft. Design loading is H20-S16-44.

• Different types of spans—The trestle spans will consist of a 7 in. deck on precast, prestressed concrete beams, which will be supported on bents made of 24 in. square precast, prestressed concrete piles. The crown of the deck will be 16 ft above mean low water (MLW), so that the bottom of beams will be above wave action in the bay.

At each end of the bridge a minimum depth of structure is desired to accommodate a future underpass.



SITE of new Tampa-St. Petersburg bridge.

Hence, the three end spans will be conventional, simply supported, reinforced concrete flat slabs, each 33 ft long.

To satisfy navigation requirements established by the Corps of Engineers, a channel span will provide clearances of 75 ft horizontally and 45 ft vertically over mean high water. This span will be 98 ft and will consist of precast, prestressed sections with cast-in-place connecting strips. After the precast sections are erected and the connections cast, the entire deck will be prestressed laterally by cables placed through it and diaphragms.

Substructures for the channel span will be conventional piers constructed on tremie seals in open cofferdams founded on steel H piles.

On the approaches to the channel span the deck will rise 34.3 ft. Grades will be ±3%, joined at the crest by a 950 ft vertical curve.

The 48 ft trestle spans will be continued upgrade to a deck elevation 28 ft above MLW, at which height the slenderness ratio of the concrete piles becomes large enough to make necessary a more rigid substructure than can be provided by the pile bents. So on each side of the channel span there will be fourteen 66 ft spans with precast, prestressed concrete beams of a type similar to those used in the 48 ft spans but larger. Substructures for the 66 ft spans will be pedestal piers with three shafts.

The pedestals will be founded on clusters of concrete piles cut off above mean low water. The bottom of the cast-in-place concrete will be placed immediately above the water line to avoid all de-watering operations. Above the top of the pedestals, the piers will be constructed in conventional manner.

• Difficult pile driving—Foundation material through most of the length of the bridge consists of compacted sand and shell, overlain with deep layers of mud and plastic clay. A preliminary program of test pile driving established the necessity of penetrating the clay layers.

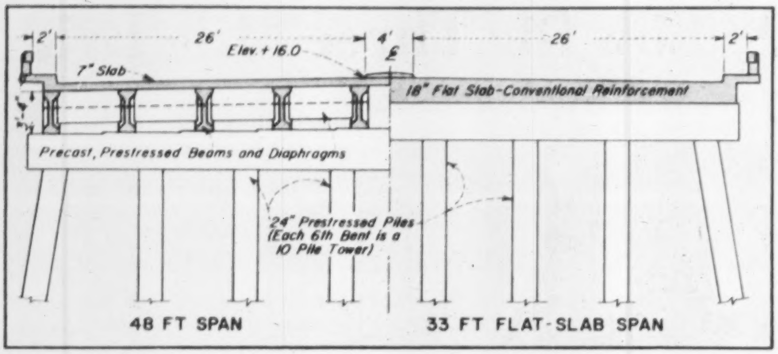
These clay layers are difficult to penetrate by jet; the material will not erode easily to permit pile penetration by jetting. The plastic characteristics of the material are evident in pile driving by distinct rebounds of the pile under hammer blows. Driving will be unusually severe and difficult through layers of 20 ft or more in thickness, the pile sinking about 1 in. per blow of a Vulcan OR hammer, then rebounding perhaps ¼ in.

(Continued on page 322)

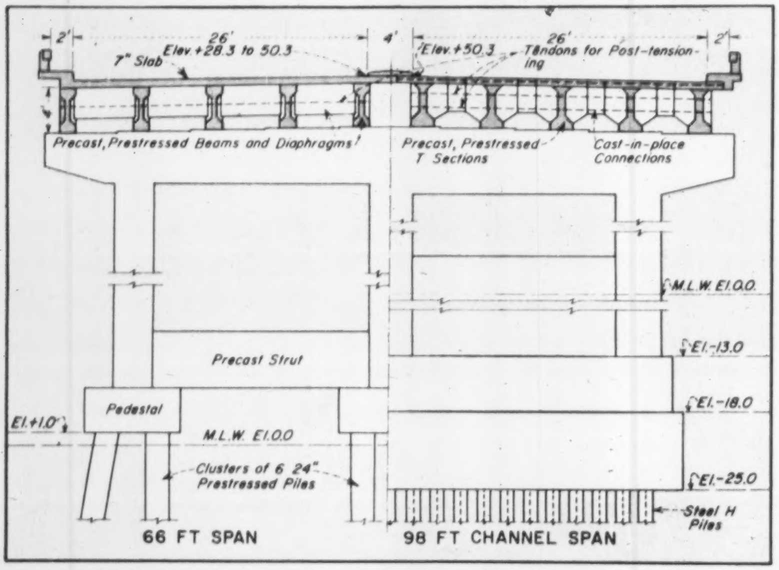
Analysis of Costs Based on Low Bid for Mid-Bay Bridge at Tampa

DESCRIPTION OF BRIDGE PARTS	TOTAL COST	SUPERSTRUCTURE		SUBSTRUCTURE		TOTAL COST	
		Cost per Lin Ft 60 Ft Width	Cost per Sq Ft	Cost per Lin Ft 60 Ft Width	Cost per Sq Ft	Per Lin Ft	Per Sq Ft
33 Ft Reinforced Concrete Flat Slabs (6 Spans, 2 Abutments, 4 Intermediate Bents)	$104,371.90	$309.30	$5.16	$217.82	$3.63	$527.12	$8.79
48 Ft Spans on Prestressed Beams (286 Spans, 46 Tower Bents, 240 Intermediate Bents)	5,020,686.20	226.83	3.78	138.89	2.31	365.72	6.09
66 Ft Spans on Prestressed Beams (28 Spans, 28 Pedestal Piers)	1,115,178.50	275.70	4.60	327.75	5.46	603.45	10.06
Channel Span on Prestressed Beams (Span and 2 Channel Piers)	154,137.20	516.20	8.60	1,056.62	**17.61**	1,572.82	26.21
Navigation Fenders	32,560.00						
Navigation Lighting	17,000.00						
Roadway Lighting	120,000.00						
Bulkheads at Bridge Ends	18,569.70						
Total contract	$6,582,503.50						

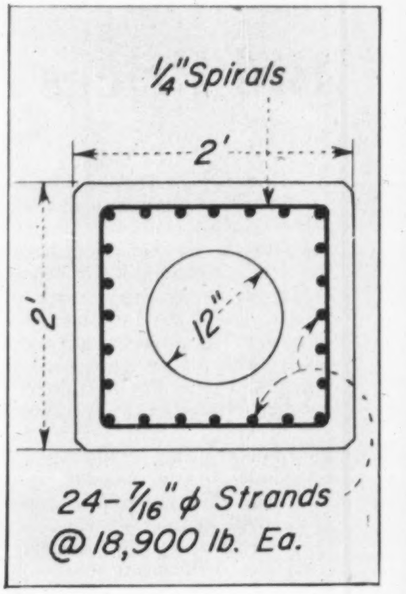
. . . An economical three-mile bridge


2'
26'
Elev. + 16.0
4'
℄
26'
2'
7" Slab
18" Flat Slab-Conventional Reinforcement
Precast, Prestressed Beams and Diaphragms
24" Prestressed Piles (Each 6th Bent is a 10 Pile Tower)
48 FT SPAN
33 FT FLAT-SLAB SPAN

SPANS are mostly beam type (l), but some are flat slabs (r.) for extra clearance.


2'
26'
Elev. +28.3 to 50.3
7" Slab
4'
Elev. +50.3
26'
Tendons for Post-tensioning
2'
Precast, Prestressed Beams and Diaphragms
Precast, Prestressed T Sections
Cast-in-place Connections
M.L.W. El. 0.0
El. -13.0
Precast Strut
El. -18.0
Pedestal
El. +1.0
M.L.W. El. 0.0
Clusters of 6 24" Prestressed Piles
El. -25.0
Steel H Piles
66 FT SPAN
98 FT CHANNEL SPAN

NEAR MID-CROSSING, 66 ft spans will carry roadway on 3% grade to channel span.


1/4" Spirals
2'
2'
12"
24-7/16" ϕ Strands @ 18,900 lb. Ea.

CONCRETE PILES, precast and prestressed, will be used for trestle foundations.

(Continued from page 321)

More than a mile of the trestle will be founded on 24 in. square piles, 100 ft long. The average length for all 24 in. piles on the project is 75 ft.

• Costs are low—Despite these rather long piles, the cost of the structure is very low. The accompanying table lists the cost of the various types used in the bridge.

It will be noted that the 48 ft trestle spans will be constructed for $365.72 per lin ft of structure, or $6.09 per sq ft for the 60 ft width between inside faces of handrails. The design of the bridge was aimed at utilization of contractors' plants in the vicinity, which are particularly equipped for this type of work.

The cost of providing the navigation clearances is shown in the table. The amount, over and above the standard trestle construction, directly chargeable to the navigation provision is $607,184, or nearly 10% of the project. The fixed span providing 45 ft vertical clearance will be constructed at a cost increment not greater than would have been required for a draw span at an elevation about 20 ft lower. The advantage of the fixed span is considerable in eliminating the hazards and delays to traffic and the costly operation and maintenance that are characteristic of many Florida bridges with draw spans.

In addition to being the largest project let to date on the Interstate System in Florida, this bridge will utilize the largest number of prestressed concrete parts in its piles and beams of any Florida project to date. Except for the steel piles supporting the channel piers and bearing shoes for the concrete beams, there will be no structural steel in the entire bridge.

The contractor for the project is Hardaway Contracting Co. which has had extensive experience on several similar nearby projects—the new Gandy Bridge over Old Tampa Bay and the trestle spans on the Sunshine Skyway over Lower Tampa Bay.

On Sept. 19, bids were received for a 3,648 ft crossing over Biscayne Bay, between Miami and Miami Beach, and a $3,543,994 contract was awarded to Powell Bros., Inc., and Heavy Constructors, Inc., Ft. Lauderdale, Fla. The bridge will carry six lanes of traffic. Its precast, prestressed beams will be supported on bents composed of 20 in. prestressed concrete piles.

For a 60 ft width, the bid price averages $971 per lin ft. Cost per sq ft comes to $16.

Computation of Navigation Increment

	Length	Cost
66 Ft Spans	1,848 Ft	$1,115,178.50
98 Ft Span	98 Ft	154,137.20
	1,946 Ft	1,269,315.70
Navigation Fenders		32,560.00
Navigation Lights		17,000.00
		1,318,875.70
1,946 Lin Ft of Trestle at $365.72		−711,691.12
Chargeable to navigation		$607,184.58

EARTHMOVING turbocharged diesel tractors set new records for yards of dirt moved per day, skid record loads of logs, clear roads, uproot mesquite with 14 ft. root plow, perform with sea-level efficiency up to 12,000 ft.

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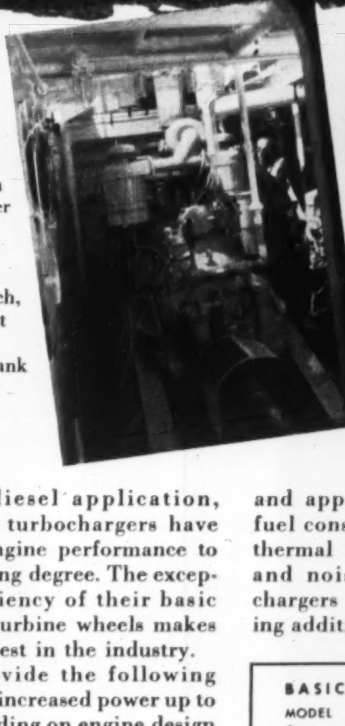
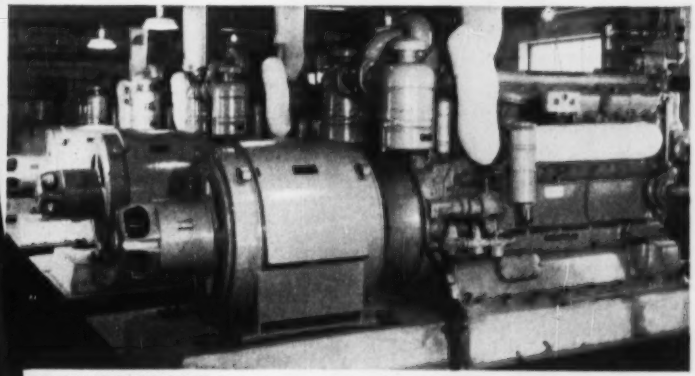


MARINE turbocharged diesel engines in the inland river towboat, *Papa Guy*, are rated at 490 horsepower each, allow the boat to tow two 20,000-barrel tank barges per trip.



POWER PLANT turbocharged diesel engines at the Barton Light and Power Plant in Vermont raise output more than 25% while decreasing fuel per horsepower hour, noise and smoke.

In every diesel application, AiResearch turbochargers have improved engine performance to an outstanding degree. The exceptional efficiency of their basic design and turbine wheels makes them the finest in the industry.

They provide the following advantages: increased power up to 100% depending on engine design and application; lower specific fuel consumption; lower engine thermal loading and less smoke and noise. AiResearch turbochargers are air cooled, eliminating additional load on the cooling system and also eliminating complicated plumbing. Experience with thousands of units in the field proves their extreme reliability and durability.

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Length — in.	10.5	12.9	16.75	14.7	17.1
Weight — lb.	40.0	95.0	125.0	112.0	135.0

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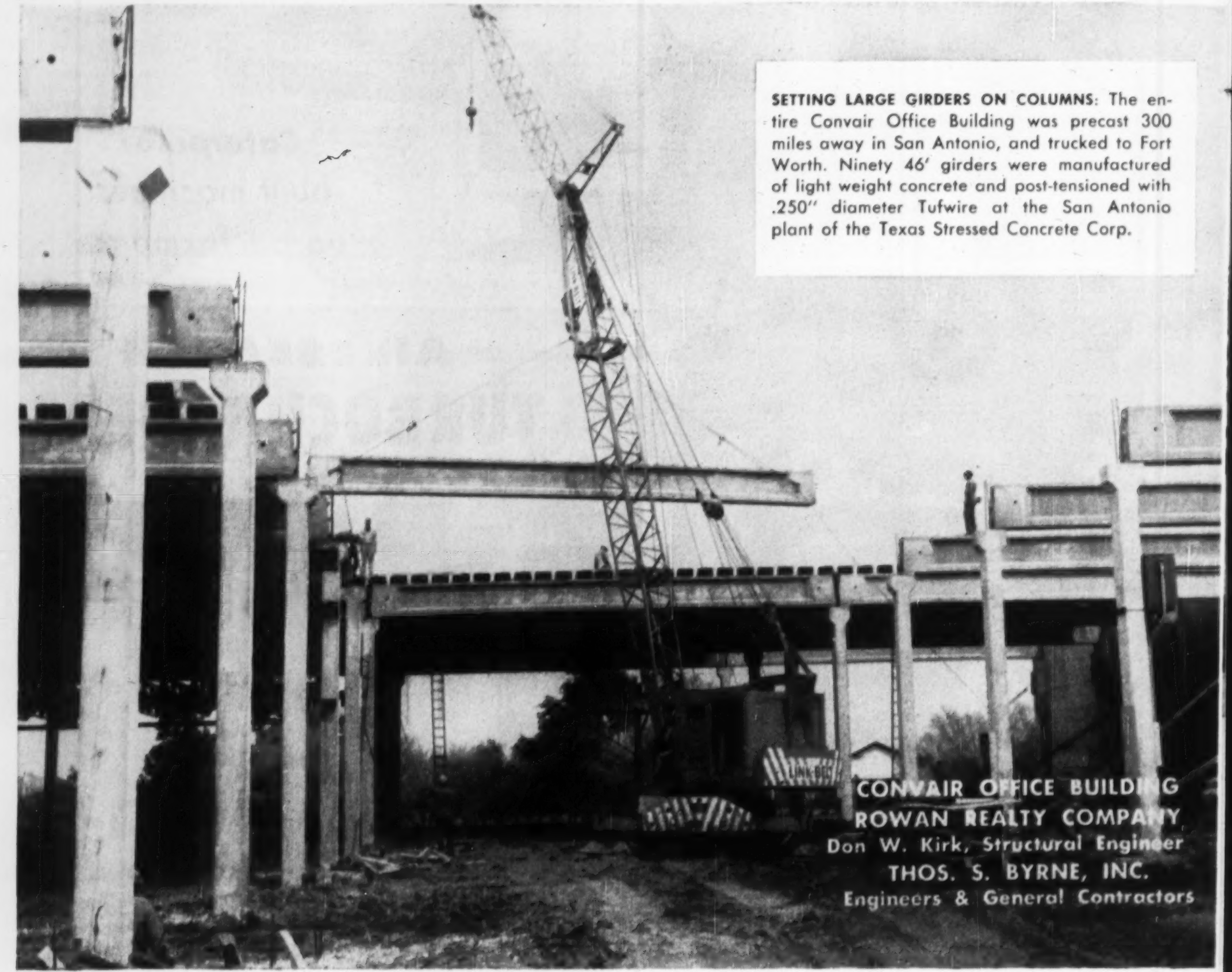


SETTING LARGE GIRDERS ON COLUMNS: The entire Convair Office Building was precast 300 miles away in San Antonio, and trucked to Fort Worth. Ninety 46′ girders were manufactured of light weight concrete and post-tensioned with .250″ diameter Tufwire at the San Antonio plant of the Texas Stressed Concrete Corp.

CONVAIR OFFICE BUILDING
ROWAN REALTY COMPANY
Don W. Kirk, Structural Engineer
THOS. S. BYRNE, INC.
Engineers & General Contractors

Products Manufacture and Erection: Texas Stressed Concrete Corporation, San Antonio, Texas

Completed in 4 Months — Despite Record Rains

The rains came. For 22 days the construction business in Fort Worth, Texas, slogged through a deluge that meant delays ranging from slow-downs to shut-downs. You can't pour concrete in the rain.

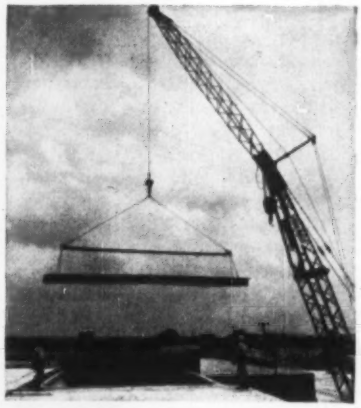
In the midst of this, an outstanding advantage of prestressed concrete construction was dramatically demonstrated — speed of erection even under adverse conditions.

The 102,000 sq. ft. Convair office building and warehouse is the case in point. The prestressed concrete structural members were erected in 13 working days — rain or no rain. The building was complete—offices, air-conditioning and all — in less than four months.

Speed of erecting is only one of many advantages that make prestressed concrete the miracle building material. Others are: great strength-to-weight ratio; less concrete needed; greater recovery after overloads; thinner sections; on schedule transportability of prestressed members; longer spans; permanence of concrete PLUS amazing flexibility and elimination of cracking; adaptability as unlimited as the imaginations of architects and engineers. Today, prestressed concrete is being used in a range of applications from fence posts to giant bridges and multi-story buildings; from movable parking lot curbs to airport runways.

Advances in the development of better high tensile strand and wire by Union Wire Rope Corporation have contributed heavily to the booming trend to prestressed construction. Once the problem of dependable tensioning materials was whipped, the way was opened wide for the "new age of concrete."

Erected In Only 13 Days



CLOSE-UP OF DOUBLE TEE BEING SET: Tuffy Slings were used as shown in placing 920 of these 4' double tee slabs. Slabs were made from lightweight concrete using Union Wire Rope "Tufwire" strand.

BUILDING ALMOST CLOSED IN: Work progresses steadily in the dreary rain as another double tee is hoisted into position. The roof structure was designed for parking. It was given a thick asphalt wearing surface.

LAST OF THE DOUBLE TEES ARE HOISTED FROM TRUCK completing roof for asphalt surface.

How Will You Share in Vast New Markets Opening For Prestressed Concrete Makers?

Looking for a new route of expansion? Want to get in on an industry that's expanding at a tremendous pace every year, with a future of fantastic dimensions? Prestressing offers opportunities not only to the on-site contractor, but also to the contractor who would like to operate a permanent casting yard as an arm of his business or as a commercial fabricator. Here are some of the opportunities:

OPPORTUNITIES in Buildings: Structures of just about every description are being built better with prestressed concrete. Office buildings, garages, warehouses, schools, motels, hospitals. Now the walls of multi-storied buildings are being poured in big slabs with openings for doors and windows, then tilted up to position. Floors are poured in "layers" separated by greased paper, then raised to upper floor levels.

OPPORTUNITIES in Bridges: The tremendous National Highway Program now under way calls for 300,000 bridges, most of which can be built much faster and more economically with prestressed concrete than with any competitive building material. Other bridges ranging from a small creek crossing to the world's longest highway bridge are built of prestressed concrete.

OPPORTUNITIES in Highways: Prestressed concrete pavement is already in the advanced experimental stage. The slabs need be only 5 inches thick, as contrasted with the ordinary 10-inch slabs used on many highways. They promise high levels of strength and permanence, speed of construction, savings in time and money. And more profit for suppliers and contractors.

These are just a few of the many uses where concrete prestressed with Union Tufwire strand and wire is proving its structural and economic advantages. Almost anything that concrete will do — it will do better when prestressed with Union Tufwire.

If you're a present user of prestressed concrete, or engaged in making it, let our engineering department and research laboratory give you and your consulting engineers a lift with any prestressing project.

If you're among those who see the big opportunity for a new plant to supply your area, let us help you explore the possibilities.

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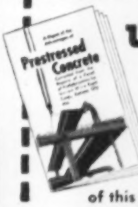

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How Beam Design Affects

Cost comparison of cross sections of standard prestressed concrete beams leads Tacoma fabricator to favor T-sections for bridges.

Arthur R. Anderson
Concrete Technology Corp.
Tacoma, Wash.

The expanded highway construction program in the United States has stimulated standardization of design for highway bridges in the span range of 25 to 100 ft.

A number of standard prestressed bridge designs have been published by the Bureau of Public Roads and others that encourage this trend.

For several years, Concrete Technology Corp. has been fabricating prestressed concrete bridges with a standard section. These bridges have been erected for county roads and for private logging roads subject to unusually heavy loads. In many cases, erection was complicated by rugged terrain in regions where field construction would have been very costly. For this reason it has been economical to factory-produce the superstructures and ship the completed components to the site.

• How cross section was chosen—Development of this standard prestressed-concrete bridge design was based on the following factors:

1. **Efficiency.** The stringers should have the required live-load capacity for minimum dead load and section area.

2. **Flexibility.** The stringer section should be adaptable to a wide range of spans. One set of steel forms could serve for all bridges within this range.

3. **Economy.** Factors 1 and 2 should be combined with a choice of stringer design that is most economical of labor and material. Moreover, the stringer must be capable of being transported and erected in rugged terrain far from the fabricating plant.

The sections found most suitable from the consideration of efficiency, flexibility and economy are shown in accompanying drawings. These T-section stringers are very satisfactory for spans ranging from 30 to 90 ft, and spans of 100 ft are feasible.

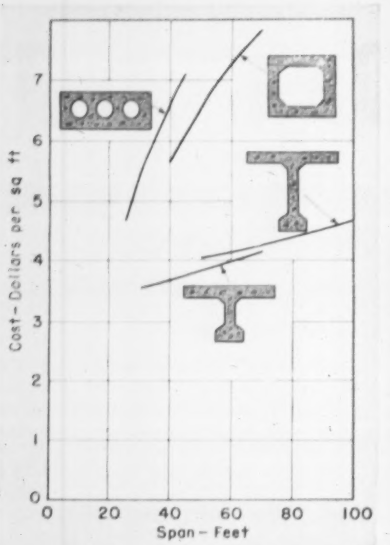
• Costs of standard bridges—To compare the costs of the T-section standard stringer design with the Bureau of Public Roads standard hollow slab and box section stringers, I made a study based on the following unit costs:

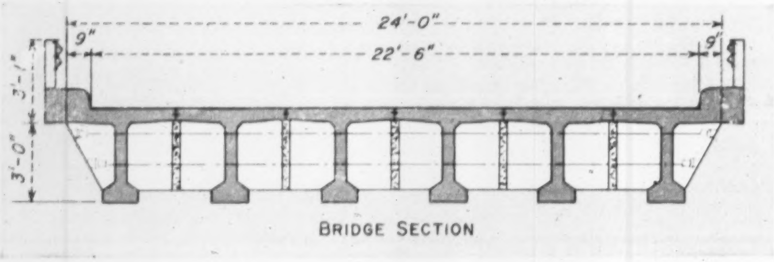
For BPR Sections:

Standard concrete at $80 per cu yd in place.

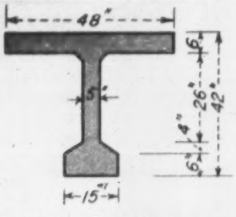
Reinforcing steel at 15¢ per lb in place.

⅜ in. prestressing strand at 10¢ per ft in place.



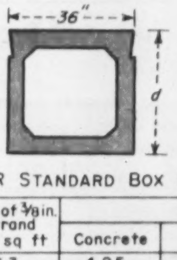


BRIDGE SECTION



COST OF LIGHTWEIGHT T-SECTIONS – TB 48/42

Span ft	Cu yd concrete per sq ft	Lb Reinf. steel per sq ft	Feet of ⅜ in. strand per sq ft	Cost – $ per sq ft			
				Concrete	Bars	Strand	Total
50	0.036	3.0	3.5	3.24	0.45	0.35	4.04
60	0.036	3.0	4.75	3.24	0.45	0.48	4.17
70	0.036	3.0	5.75	3.24	0.45	0.58	4.27
80	0.036	3.0	7.0	3.24	0.45	0.70	4.39
90	0.036	3.0	8.5	3.24	0.45	0.85	4.54
100	0.036	3.0	10	3.24	0.45	1.00	4.69



COST OF BPR STANDARD BOX SECTIONS

Span ft	d in.	Cu yd concrete per sq ft	Lb Reinf. steel per sq ft	Feet of ⅜ in. strand per sq ft	Cost – $ per sq ft			
					Concrete	Bars	Strand	Total
40	24	0.053	5.0	6.3	4.25	0.75	0.63	5.63
50	30	0.0612	5.15	8.35	4.90	0.77	0.84	6.51
60	36	0.0687	5.45	9.35	5.50	0.82	0.94	7.26
70	42	0.074	5.55	10.68	5.92	0.83	1.07	7.82

Prestressed Concrete Bridge Costs

For T-Sections:

Lightweight concrete at $90 per cu yd in place.

Reinforcing steel at 15¢ per lb in place.

$\frac{3}{8}$ in. prestressing strand at 10¢ per ft in place.

A break-down of material quantities and cost per square foot are given in accompanying tables for four standard prestressed concrete sections. These costs are plotted as a function of the span in a chart.

The differences in relative cost per square foot can be attributed to several factors. In the first place, a designer can reduce cost of prestressed concrete bridges in several ways. Obviously, saving material without increasing the production cost is an important consideration. To do this, the designer must try to design a member whose section modulus is a maximum for a given concrete area. Weight reduction is another consideration. For example, use of lightweight high-strength concrete reduces the dead-load stresses and saves on transportation and erection cost. Furthermore, a considerable saving in prestressing steel is possible when both these objectives have been attained.

• **Composite concrete construction**—Prestressed concrete stringers designed to support cast-in-place concrete decks are finding increasing application for highway bridges. The beams carry the deck dead-load, and after the slab concrete has reached a splecific strength, the live-load on the structure is taken by the composite action created between the stringers and the slab.

A series of four standard stringer sections has been proposed by a joint committee of the American Association of State Highway Officials and the Prestressed Concrete Institute. These sections have been developed to carry H20-S16 loads over spans ranging from 30 to 100 ft.

Concrete Technology Corp. has developed a series of 17 prestressed concrete I-beam sections applicable to both building and bridge construction. These sections and their properties for design are given in a table (p. 328). For some applications, they have been produced with 7,500 psi concrete, and the maximum working stresses for maximum superimposed moments, M., are given in the table. However, for a cost study, I assumed the concrete strength to be 5,000 psi, and the maximum working stresses to be 2,000 psi or less.

As a designer approaching the problem of relative cost of prestressed concrete stringer sections, I assumed spans of 60 ft, 75 ft, and 100 ft and H20-S16 loading, with the stringers spaced 5 ft 6 in. on centers under a 7 in. cast-in-place concrete deck. The AASHO-PCI beams recommended for these spans were analyzed and compared with three beams selected from the I-Beam table. In all cases, it was also assumed that a concrete of 5,000 psi compression strength, and a prestressing steel of 250,000 psi tensile strength would be specified.

The maximum working stresses in the beams studied were for concrete, 2,000 psi and for prestressing steel, 150,000 psi.

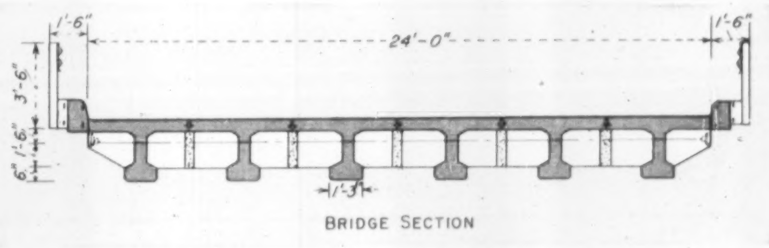
To determine relative costs per linear foot of stringer, the following basic costs were assumed.

Concrete in place	**$80 per cu yd**
Prestressing steel, including hardware	**44¢ per lb**
Reinforcing steel in place	**15¢ per lb**

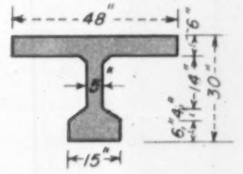
These costs are used in this analysis only for comparisons, and of course, would be subject to some variation, depending on prevailing costs for labor and material in a given locality.

• **Costs of stringers**—Summary tables

(*Continued on page 328*)

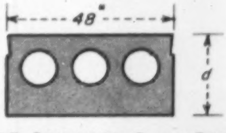


BRIDGE SECTION



COST OF LIGHTWEIGHT T-SECTIONS – TB 48/30

Span ft	Cu yd concrete per sq ft	Lb Reinf. steel per sq ft	Feet of 3/8 in. strand per sq ft	Cost – $ per sq ft			
				Concrete	Bars	Strand	Total
30	0.032	3.0	2.25	2.88	0.45	0.23	3.56
40	0.032	3.0	3.50	2.88	0.45	0.35	3.68
50	0.032	3.0	5.0	2.88	0.45	0.50	3.83
60	0.032	3.0	6.5	2.88	0.45	0.65	3.98
70	0.032	3.0	8.25	2.88	0.45	0.83	4.16



COST OF BPR STANDARD SLAB SECTIONS

Span ft	d in.	Cu yd concrete per sq ft	Lb Reinf. steel per sq ft	Feet of 3/8 in. strand per sq ft	Cost-$ per sq ft			
					Concrete	Bars	Strand	Total
25	14	0.0445	2.6	7.5	3.56	0.39	0.75	4.70
30	16	0.050	2.5	10.0	4.00	0.38	1.00	5.38
35	19	0.0571	2.54	11.0	4.57	0.38	1.10	6.05
40	21	0.058	2.56	11.5	4.64	0.38	1.15	6.17
45	24	0.067	2.75	13.0	5.36	0.41	1.30	7.07

. . . Standard-beam costs

(Continued from page 327)

PRESTRESSED BEAM is erected in rough terrain far from fabricating plant.

give section properties and relative costs of the two types of stringer sections for spans 60, 75, and 100 ft.

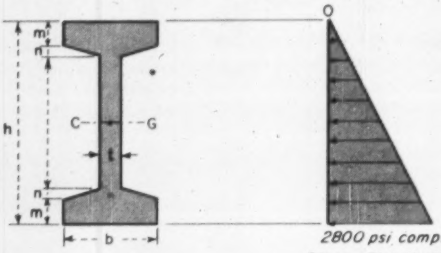
It is obvious that the superior properties of the I-beam sections developed by Concrete Technology Corp. is due to the relatively thin webs and larger percentages of the section concentrated in the flanges. Admittedly, some doubt has been expressed about the practicability of casting prestressed concrete sections of such seemingly extreme proportions. Nevertheless, hundreds of these beams have been fabricated with complete success.

A cost factor not considered in this study, but of considerable importance, is the total weight of a prestressed member. For example, compare the total weights of the 100 ft beams of the two types exclusive of end blocks:

AASHO–PCI beam	82,500 lb
CTC IB 24/56	56,500 lb
Difference	26,000 lb

Not only does the added weight cost more to transport and erect, but the weight difference could be a controlling factor in determining the feasibility of a prestressed concrete design for a particular project.

PROPERTIES FOR DESIGN OF PRESTRESSED CONCRETE I-BEAMS*



Section Dimensions

Stress Distribution Prestress + Dead Load Bending for Spans up to Critical (LCR)

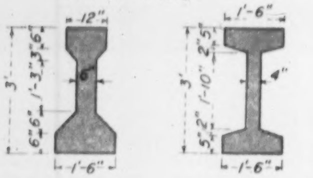
Beam Symbol	Wt. per Foot	Area	b	h	Z	ICG	LCR	Max Ms†	t	m	n
	Lb	In.^{2}	In.	In.	In.^{3}	In.^{4}	Ft.	K-Ft.	In.	In.	In.
IB 12/24	155	148	12	24	916	11,000	53	214	3	3½	1½
IB 12/28	167	160	12	28	1169	16,360	60	272	3	3½	1½
IB 12/32	179	172	12	32	1438	23,000	67	336	3	3½	1½
IB 12/36	196	184	12	36	1723	31,020	74	402	3	3½	1½
IB 15/32	248	238	15	32	1945	31,120	71	454	4	4	2
IB 15/36	265	254	15	36	2340	42,100	76	546	4	4	2
IB 15/40	281	270	15	40	2757	55,120	81	643	4	4	2
IB 18/36	325	312	18	36	2990	53,770	73	698	4	5	2
IB 18/40	342	328	18	40	3510	70,260	78	819	4	5	2
IB 18/44	358	344	18	44	4060	89,340	83	948	4	5	2
IB 18/48	375	360	18	48	4640	111,300	88	1084	4	5	2
IB 18/52	392	376	18	52	5240	136,170	92	1224	4	5	2
IB 18/56	408	392	18	56	5850	163,800	96	1365	4	5	2
IB 24/48	547	525	24	48	6820	163,830	89	1592	5	6	3
IB 24/52	568	545	24	52	7720	200,570	92	1802	5	6	3
IB 24/56	588	565	24	56	8630	241,730	95	2015	5	6	3
IB 24/60	610	585	24	60	9570	287,100	100	2232	5	6	3

* *Concrete Technology Corp.*

† *Maximum superimposed moment*

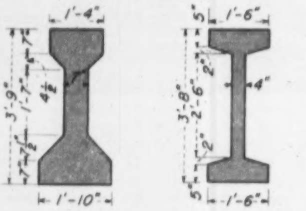
COST OF STRINGERS FOR COMPOSITE CONSTRUCTION

60 FT SPANS



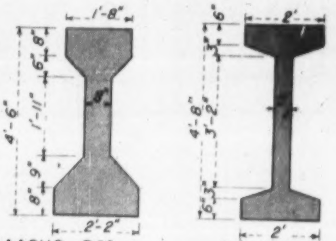
	AASHO - PCI II	CTC IB 18/36
Area - sq in.	369	312
Mom. of inertia	50,980	53,770
Wt - lb per ft	384	325
Prestress force-kips	412	352
Tendons - lb per lin ft	9.36	7.39
Reinf. steel-lb per lin ft	8.0	8.0
Concrete-cu yd lin ft	0.095	0.08
Costs — $ per Lin Ft		
Prestressing steel	4.12	3.52
Reinforcing steel	1.20	1.20
Concrete	7.60	6.40
Total	12.92	11.12

75 FT SPANS

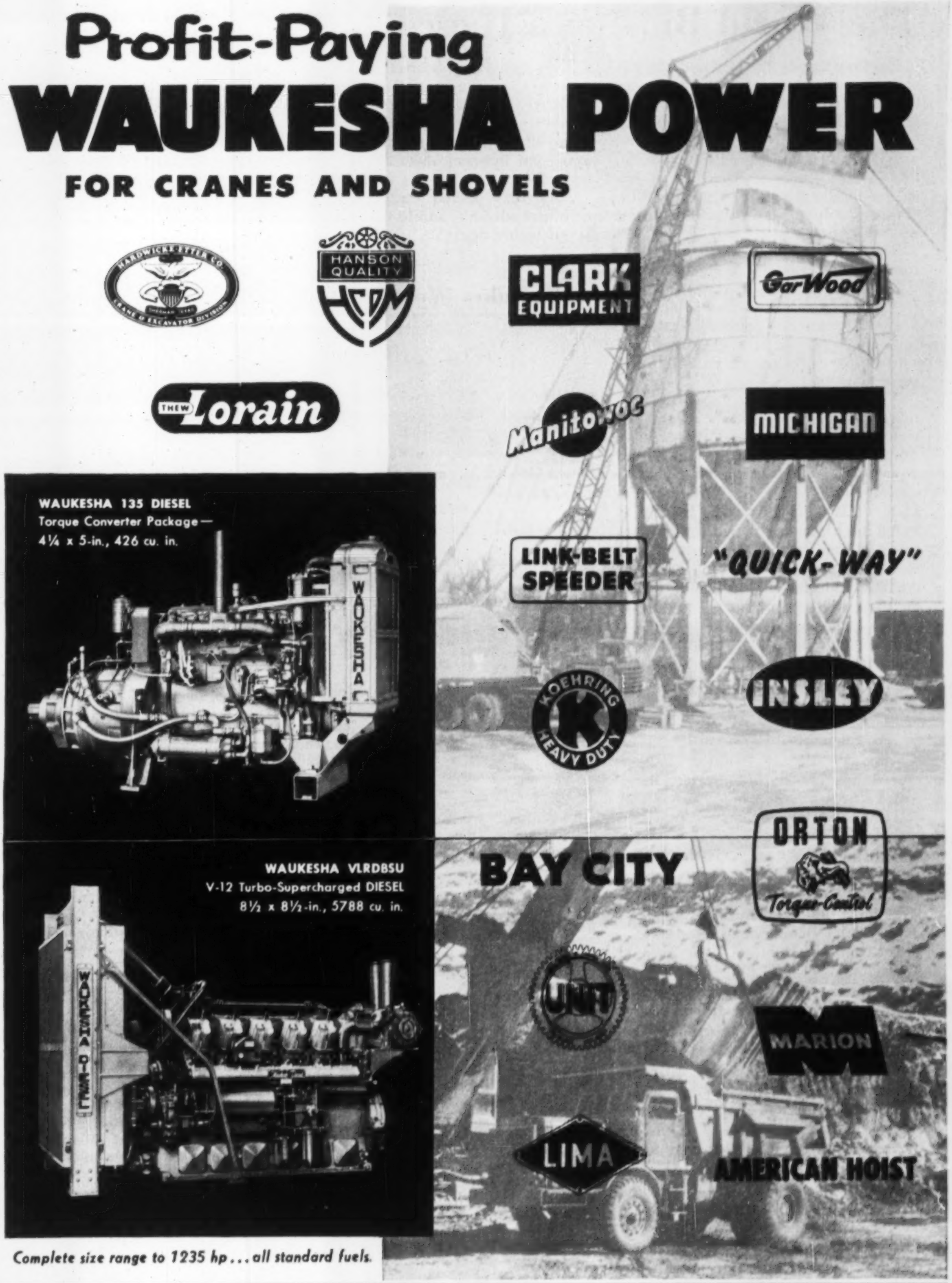


	AASHO - PCI III	C. T. C. IB 18/44
Area - sq in.	560	344
Mom. of inertia	125,390	89,340
Wt. - lb per ft	585	358
Prestress force-kips	530	430
Tendons - lb per lin ft	12.05	7.82
Reinf. steel-lb per lin ft	10.0	10.0
Concrete-cu yd lin ft	0.144	0.0885
Costs — $ per Lin Ft		
Prestressing steel	5.30	4.30
Reinforcing steel	1.50	1.50
Concrete	11.50	7.08
Total	18.30	12.88

100 FT SPANS



	AASHO - PCI BEAM TYPE IV	C.T.C. BEAM TYPE IB 24/56
Area - sq in.	789	565
Mom. of inertia	260,730	241,730
Wt. - lb per ft	825	588
Prestress force-kips	845	660
Tendons - lb per lin ft	19.20	15.00
Reinf. steel - lb. per lin ft	12.0	12.0
Concrete - cu yd per lin ft	0.203	0.145
Costs — $ per Lin Ft		
Prestressing steel	8.45	6.60
Reinforcing steel	1.80	1.80
Concrete	16.25	11.60
Total	26.50	20.00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Complete size range to 1235 hp . . . all standard fuels.

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The World Bids on a Hydro Job

For complications, open bids to the world on designing, manufacturing and furnishing hydro-power equipment. This Cuba did for its 45,000 kw Hanabanilla hydro project (ENR June 14, 1956, p. 73 and December 6, 1956, p. 274). PRICHEC, (Primera Central Hidroelectrica Cubana) is the owner. TAMS, (Tippetts-Abbett-McCarthy-Stratton) is its consultant.

The heavier equipment drew the bids shown here from nine countries.

Variations to be reconciled involved also point of delivery, time of delivery, liquidated damages, escalation clauses, furnishing of erection engineers and supervising mechanics and their expenses, currency conversion.

The international competition for this equipment, as shown in the accompanying tables, has been partially simplified here because all prices are reported in Cuban pesos, whereas sterling, DM marks, Swiss francs, yen, U. S. dollars are involved. Except as noted, each amount shown for contract price is firm (without escalation) and is based on payment from letter of credit established in country of manufacturer. Except as noted, prices are FAS foreign port.

The combination of technical reasons, reconciliation of conditions and terms, timing and convenience are indicated in the text covering the major equipment.

Two Francis turbines rated 17,300 hp at best gate for 870 ft head, 720 rpm and stainless steel runners were specified. Prices listed included services of erecting engineer and supervising mechanic.

The low price from Hitachi, Japan, was for welded steel instead of cast steel scroll case. But even with cast steel substituted the turbine was 30 to 50% lighter than the others. Of the next two lower bids from Ansaldo San Giorgio, Italy, and Franco Tosi, Italy, the latter was preferred because price was not subject to escalation and because of better guarantees of performance and delivery.

The engineers preferred to substitute Woodward speed-responsive governors for the acceleration-responsive governors proposed by Franco Tosi. The size of the valves were later selected to be 1.2 meter diameter instead of 1.0 meter diameter in original bid, for economy in penstock design. The final Franco-Tosi contract in US$ was $115,550 for 2 turbines, $48,600 for 2 valves, $36,150 for 2 Woodward governors, $7200 for spare runner, $4,100 for generator-turbine shaft alignment, and $9,710 for about 200 man-days supervisory erection personnel.

Two generators, rated 11,350 kva with 60 C. temperature rise were specified. AEG which is short for Allegemeine Elektricitats Gesellschaft, of Germany offered lowest price for units with minimum flywheel effect (WR^2) specified.

Also AEG offered alternative design with considerable additional WR^2 believed highly desirable by the engineers for Hanabanilla plant, at small increase in cost. Alternative design was selected at cost of $270,686 for 2 units including 540 man-days of supervisory erectional personnel.

The PRICHEC Board is headed by Emeterio S. Santovenia, President. Eugenio Castillo is General Manager.

For TAMS, L. A. Lovell, partner, directs the work, P. S. O'Shaughnessy is resident manager in Cuba and A. S. Goodman is project engineer in New York.

Cuba Takes World-Wide Bids on Hydro Equipment

Bids From:	Switchgear 15 KV 12-8-55 Bids CP	Switching 115 KV Equipment & Sta Battery Equipment 1-5-56 Bids CP	Switch Boards & Carrier Current Equipment 1-9-56 Bids CP	13.8 KV Power Cable 1-12-56 Bids CP	Inclined Railway Equipment 5-7-56 Bids CP	Travelling Cranes for Power Sta & Access House 7-27-56 Bids CP	Intake Gates & Hoists 7-2-56 Bids CP	Power Conduit Steel liner & Manifold 11-5-56 Bids CP
United States								
General Electric	......	51,775	73,141	68,271	......	......	......	......
Westinghouse	25,134	50,788	65,130		......	......	......	......
Phelps Dodge	......	......	......	58,544	......	......	......	......
Harnischfeger	......	......	......	......	......	85,850		......
Philips & Davies	......	......	......	......	......	......	129,110b	......
Kerite	......	......	......	75,599	......	......	......	......
Simplex Wire & Cab	......	......	......	81,224	......	......	......	......
Italy								
Atub (Brescia)	......	......	......	......	......	......	......	181,280
England								
British Insul Callendar's	......	......	......	55,681c	......	......	......	......
Germany								
Ferrostaal (Maier)	......	......	......	......	97,960ge	......	......	......
Fred Krupp	......	......	......	......	......	......	......	200,130
Dortmunder Union	......	......	......	......	......	......	......	211,594
American MAN	......	......	......	......	......	......	......	290,850
Switzerland								
Brown-Boveri	33,202	......	......	......	......	......	......	......
Austria								
Voest	......	......	......	......	......	......	......	196,140
Belgium								
ACEC	24,542a							
Contract	24,641	49,792	63,853	57,397	88,383f	85,770fg	100,000f	183,411

a . . . cif Cuban port b . . . fob German port c . . . fob Liverpool d . . . includes 10% assumed for escalation e . . . plus escalation f . . . negotiated g . . . 3 other bids rejected h . . . proposal submitted i . . . shaft alignment not included j . . . Leffel k . . . Maier

Bids From:	Turbines Governors Valves 10-13-55 Bid CP	Generators 10-13-55 Base Bid CP	Generators 10-13-55 Alternate Bid CP	480-Volt Stat Serv Switchgear 11-21-55 Bid CP	Transformers 11-21-55 Bid CP
United States					
General Electric	357,418j	505,927	....	49,405	129,079
Westinghouse	....	380,680	....	41,989	133,095
Federal Pacific Elect.	....	....	....	37,293	....
Wagner Electric	....	....	....	......	135,865
Italy					
Marelli	....	265,883	260,783	......	89,107
Brown-Boveri	....	267,408	....	41,351	116,521
Ansaldo San Giorgio	186,890d	....	....	......	97,080d
Franco-Tosi	190,862	....	....	......	....
Elect. Due Stelle	....	....	....	37,600a	....
Industri Electtriche	....	....	....	......	131,675
England					
English Electric	384,093	375,087	....	......	121,508
Metropolitan Vickers	....	....	....	......	118,561
Germany					
A E G	....	254,061i	266,736i	37,109b	107,815b
Ferrostaal	214,043k	....	....	......	....
Switzerland					
Oerlikon	....	295,607	....	......	102,260
Escher Wyss	249,007	....	....	......	....
Austria					
American Elin	....	277,585	....	......	117,100
France					
Savaisienne	....	....	....	......	137,926a
Belgium					
ACEC	....	....	....	......	123,728ae
Japan					
Hitachi	134,758	261,453	256,083	......	....
Mitsubishi	196,671	....	....	......	....
Contract	221,310	....	270,686	37,293	87,360

Forms are tied in a central location. Two men tie an 8-foot column form in an average of 5 minutes using Signode steel strapping and 2-piece tool set.

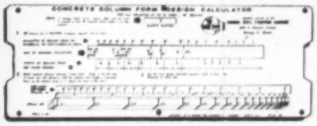
Strapped form is lowered to the floor below over reinforcing rods. Strap placement per Signode formula.

Contractor ties concrete column forms in 5 minutes with Signode steel strapping

Seth E. Giem & Associates, Memphis, Tenn., is an old hand at using Signode steel strapping for tying forms for concrete columns. These pictures were taken during construction of the Bronson Hospital Nurses' Home, Kalamazoo, Mich.

Signode has developed form designs and strap spacing formulas for a variety of column sizes—can save you a lot of time in getting started right in the time-saving application of steel strapping to your forms. Call the Signode man near you, or write:

Send $1.00 for New Signode Form Design Calculator to Reduce Column Form Costs



It costs only a dollar—can save many, many times its cost on a single job . . . shows strap size, strap spacing for four safety factors . . . includes columns and piers up to 65" diagonal or diameter . . . illustrates six tested truss designs. For architects, contractors, engineers. Mailed promptly with instruction booklet.

Strapping is stripped in moments with Signode cutters. No form clamps to move.

A complete basement form. Note smooth finish, squareness, flatness. There's no bulge.

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The Cost of Engineering Services

This Engineering Services Cost Index, prepared by James D. Mamarchev and his associates, consulting engineers, Houston, Tex., has been used for several years by them in estimating cost of engineering on new construction and in industrial plant evaluation work as a part in the preparation of reproduction cost indices.

The index reflects the trend of cost of engineering personnel since 1923 in connection with the engineering part of construction projects in the industrial field. Here are the index numbers:

1925 = 100

1923	*96*	*1940*	*117*
24	*97*	*41*	*130*
25	*100*	*42*	*143*
26	*105*	*43*	*156*
27	*108*	*44*	*169*
28	*111*	*45*	*182*
29	*113*	*46*	*198*
30	*106*	*47*	*211*
31	*87*	*48*	*226*
32	*85*	*49*	*239*
33	*85*	*50*	*251*
34	*84*	*51*	*267*
35	*83*	*52*	*275*
36	*90*	*53*	*283*
37	*97*	*54*	*291*
38	*103*	*55*	*303*
39	*110*	*56*	*313*

As a basic unit of such cost a composite is used, consisting of an office and field engineering force of a selected average number of different grades of draftsmen, engineers, supervisors and clerical help as applied to an engineering project of planning, design and supervision of construction of a specific magnitude. Fringe benefits and overhead are included, but no profit.

The basic cost figures of each grade of engineering force have been collected and averaged on a national basis through years and have been checked against available information of practicing engineering companies, the publications of the U. S. Bureau of Labor Statistics and data appearing in the engineering periodicals.

• Compared to construction costs—It may be of some use to compare Mr. Mamarchev's engineering services cost index figures with ENR's construction and building cost indexes. From 1923 to 1957 his index number has increased by a factor of 3.2; building costs have gone up 3.3 times; construction costs are up 2.7 times.

• Other engineering cost indicators—There are other indicators of engineering costs, of course.

One of the best of these for engineers in construction is the biennial check on engineer salaries made by the American Society of Civil Engineers. Published just recently as Volume 83 No. BD1 (August, 1957) in the ASCE PROCEEDINGS, the 1957 ASCE Salary Survey presents the civil engineer earnings picture regionally, by type of employer, and by grades of employee.

Significant findings of this recent report by the ASCE include the observation that percent gains in salary registered by all but the top grade (Grade IX) ranged from 14% to 20% from 1955 to 1957. Although starting salaries continued to grow—up roughly 20%, from about $4,000 to nearly $4,800—the salaries of higher grades, more experienced engineering employees, also showed a healthy gain during the last two years.

ASCE also has instituted recently a quarterly engineering salary index, for state highway departments and for consulting firms in selected cities. Based on salaries in effect May 15, 1957 (equal 1.0), the index numbers are too new as yet to present much of a history.

• Engineers' salaries, in general—There are other recent indicators of engineer salaries in reports of Engineers Joint Council and the National Society of Professional Engineers.

The latter group, NSPE, recently published a report on its 1956 Income and Salary Survey. Third such survey in a series that began in 1956, this one found civil engineers had the lowest median annual earnings—$8,750 as compared to a $9,490 median for all engineers reporting. This survey was based on information from 17,045 members of NSPE. The report is available for $1.00 to non-members (50¢ to members) from NSPE, 2029 K St., NW, Washington, D.C.

The EJC salary survey, conducted in 1953 and again in 1956, has grown to represent returns from over 107,000 engineers. A recent analysis by EJC's staff indicates the 1953-56 gain in engineer salaries as follows:

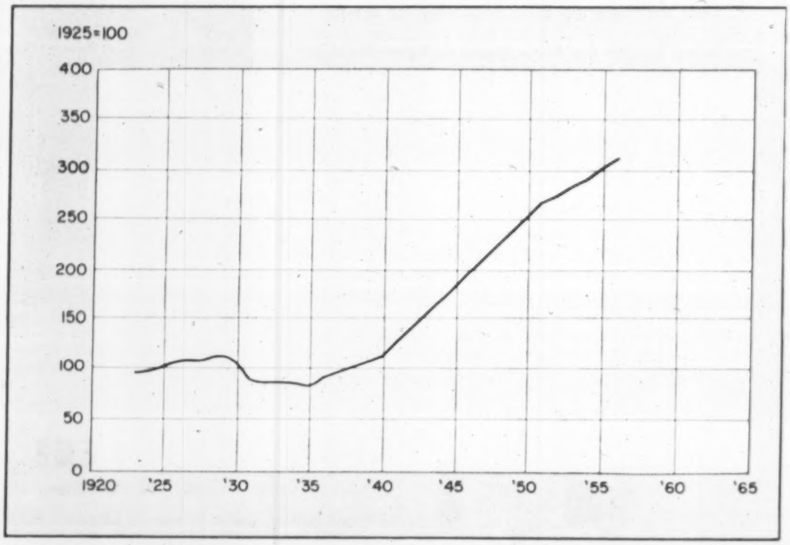
Increases were over 24% for 22 years of experience; 35% for those with 8 years from baccalaureate degree; and about 24% for those one year out of school (all gains are 1956 over 1953). The three years' increases have been plotted by EJC and are shown to level out at about 17% for the older engineers, 30 to 40 years of experience.

EJC points out, incidentally, that earnings of all full-time wage and salary employees rose 12% in this three year period, according to the U. S. Department of Commerce.

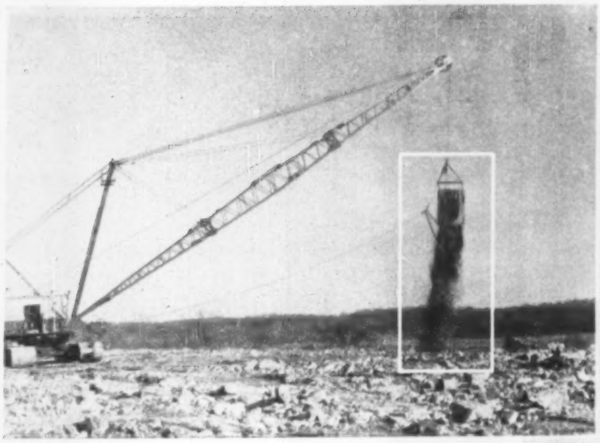
Some engineering fees (as opposed to costs) may have grown exactly as have building and construction costs. These would be the fees figured as a percentage of project costs. But there are lots of engineering service charges figured on a cost-plus-fixed-fee, fixed lump sum fee, per diem, or hourly basis; these have not necessarily grown exactly as have construction costs. In fact, there is even concern over whether the fee curves based on project costs might now need some revision.

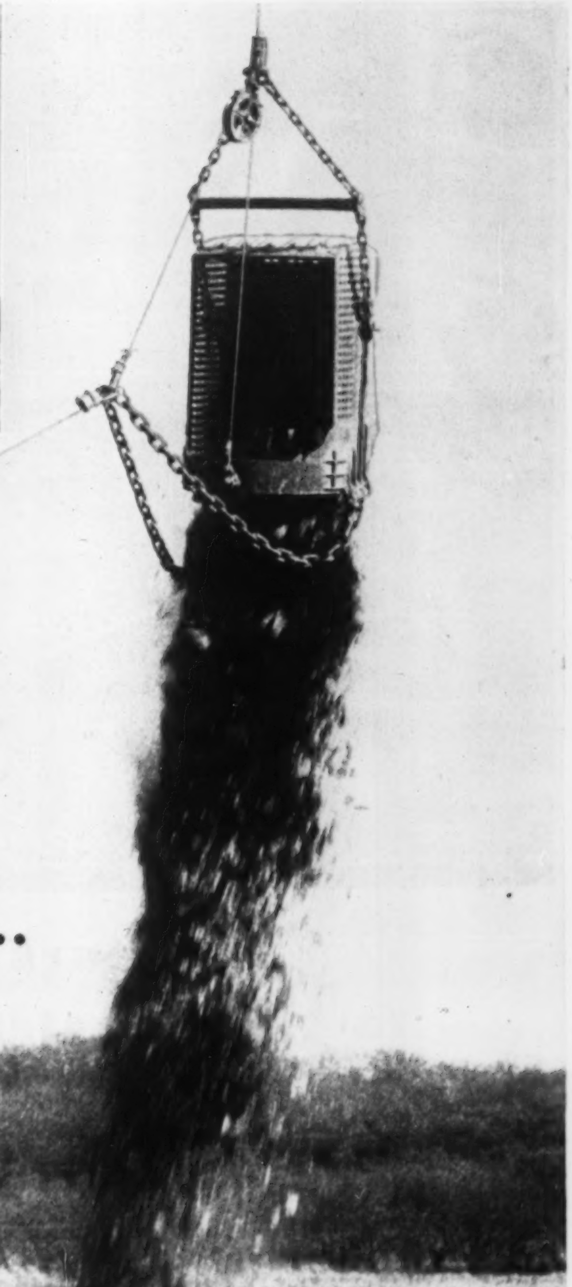
An ASCE subcommittee composed of President-elect Louis R. Howson, Gustav Requardt and Karl R. Kennison has been at work surveying the consulting field for facts and opinions that may lead to an upward revision of median fees as published in ASCE's Manual of Practice No. 29.

Early indications are that this subcommittee, which completed its fact-finding stage but has drawn no conclusions yet, might find Manual 29's 1952-vintage curves low for smaller jobs.



ENGINEERING SERVICE COST INDEX by James D. Mamarchev & Associates.





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50 Years of Service to the Construction Industry

Symbolizing Bethlehem's 50 years of experience in the production of structural steel are the two catalogs shown above. At the left is a first edition of the 1907 catalog. At the right is the new catalog published in 1957.

Since 1907, when Bethlehem installed the country's first mill to roll wide-flange shapes, Bethlehem has been a leader in supplying the construction industry with a full range of structural steel products.

The Bethlehem, Pa., plant of Bethlehem Steel Company has recently completed an extensive expansion of its production facilities for structural steel shapes.

Today, when buildings, bridges and highways are going up faster than ever before, the new capacity at our Bethlehem Plant provides an important and much-needed additional supply of structural steel for builders throughout the nation.

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BETHLEHEM STEEL

How Depreciation Affects Feasibility of Construction

Cost engineers should play a larger role than heretofore in advising what the rate of depreciation should be on physical plant, in the opinion of Dr. Bernard J. Gaffney of The Rust Engineering Company, New York. One major reason for this is the dual role that depreciation plays in determining economic feasibility of a capital investment in new plant or other facilities such as a toll road or bridge—Will it pay off? When?

Another major reason is that in these days of such rapid technological advance there is always the risk that a process, thus also the plant that houses it, will be outmoded or obsolete before its cost is written off.

Since it is the cost engineer's function to forecast what the costs are going to be (the cost accountant records what they were) the cost engineer must consider the useful life of the capital improvement as well as its cost.

Dr. Gaffney, in a paper presented before the American Association of Cost Engineers, listed these elements in the problem of justifying investment in a new plant:

1. **Erected Cost**
2. **Operating Capital and Costs**
2. **Life of:**
    - **(a) Physical Assets and**
    - **(b) Process**
4. **Income Resulting from the Improvement**

Since depreciation is the process of recapturing the original capital investment, the rate at which it is taken affects both profits and payout time:

Payout Time (Y) =

$$\frac{\text{Capital Investment } (C)}{\text{Net Profit after Taxes } (P_n) + \text{Depreciation } (D)}$$

$$Y = \frac{C}{P_n + D}$$

Net Profit after Taxes works out like this:

$$P_n = (x_p y_p - S - x_k y_k - D - E - I)\,(1 - t),$$

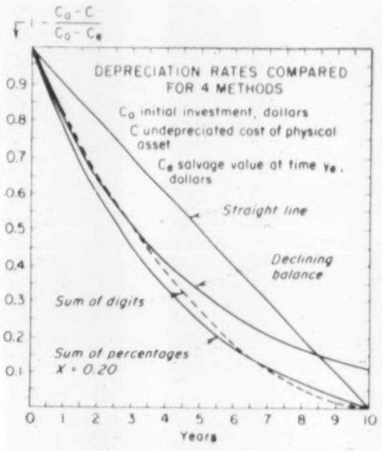
where

P_n	is net profit after taxes
$x_p y_p$	income or sales
S	cost of sales
$x_k y_k$	key material cost
D	depreciation
E	overhead expense
I	interest on principal
t	tax rate expressed as a decimal

Thus depreciation enters twice in determining payout time, and the method selected for computing it becomes a basic business decision even before the new facilities are built.

In addition to the three common methods, in use since the 1954 revision of the tax law which allows much more liberal treatment than before of depreciation allowances, Dr. Gaffney has developed a new method called "sum of percentages" which would permit faster write-offs than any of the present standard formulas. This incorporates a declining balance principle yet provides, unlike present practices, for a predeter-

(Continued on page 336)



Write-Off Compared

Depreciation Method	Yrs to Reach 1/2 Tot D	Times Faster than SL	Accum at 2/3 of Life
Straight Line	5.0	1.0	.666
Declining Balance (x = 0.20)	3.1	1.61	774
Sum of Digits	3.1	1.61	848
Sum of Percentages (x = 0.20)	2.65	1.89	867
(x = 0.169)	2.95	1.70	849

x = fraction of unrecovered cost expressed as decimal

Accumulated Depreciation By Method by Years

At End of Year	Straight Line	Declining Balance x = 0.20	Sum of Digits	Sum of Percentages x = 0.20
1	1	200	182	224
2	2	369	345	403
3	3	488	490	547
4	4	590	618	662
5	5	672	727	753
6	6	738	818	827
7	7	790	891	885
8	8	832	945	932
9	9	866	982	970
10	1 0	903	1 000	1 000

NOTE: Declining Balance method applies fractional reductions to initial cost, C_o; other methods apply reductions to $C_o - C_e$, initial cost less salvage value.

Formula For Computing Depreciation

Method	Differential Rate $D = \frac{-dC}{dy}$	Annual Depreciation	Cumulative Depreciation
Straight Line	$\frac{C_o - C}{y_e}$	$\frac{C_o - C_e}{y_e}$	$\frac{y\,(C_o - C_e)}{y_e}$
Declining Balance	$[(1-x)^y \ln(1-x)]\,C_o$	$x(1-x)^{y-1}\,C_o$	$1 - (1-x)^y]\,C_o$
Sum of Digits	$\left[\frac{2(y_e - y) + 1}{y_e(y_e + 1)}\right](C_o - C_e)$	$\frac{2}{y_e}\left[\frac{y_e + 1 - y}{y_e + 1}\right](C_o - C_e)$	$\frac{y}{y_e}\left[\frac{2y_e - y + 1}{y_e + 1}\right](C_o - C_e)$
Sum of Percentages	$X^y \ln X\left[\frac{C_o - C_e}{1 - X^{y_e}}\right]$	$\frac{x(1-x)^{y-1}(C_o - C_e)}{1 - X^{y_e}}$ #	$\left[\frac{1 - X^y}{1 - X^{y_e}}\right](C_o - C_e)$

for any time interval $\frac{x^{y_2} - x^{y_1}}{y_2 - y_1}\left[\frac{C_o - C_e}{1 - X^{y_e}}\right]$

on undepreciated cost it is $\frac{xC}{1 - X^{y_e}} = \frac{xC}{1 - (1-x)^{y_e}}$

Where

C	undepreciated COST of a physical asset, dollars
C_v	undepreciated VALUE of a physical asset, dollars
C_e	salvage value at time y_e, dollars
C_o	initial investment, dollars
D	depreciation, dollars per year
d	differential
y	time of depreciation in years (or other consistent unit such as semi-annual, month, etc.). $y = C/D$ where D is average depreciation
y_e	useful life of physical asset, years
Y	payout time, years (when the sum of accumulated net profit and accumulated depreciation equals investment $Y = C/P_n + D$
P_n	net profit after taxes
p	fractional increase or decrease, with time in price of an asset
x	fraction of unrecovered cost expressed as a decimal
X	$1 - x$
ln	natural logarithm

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. . . Depreciation

(*Continued from page 335*)

mined salvage value depreciating any allowable amount to zero value.

These principal methods of depreciation authorized by the present federal tax law are compared in the accompanying tables and charts to show both rate of write-off and accumulated depreciation. The "sum of percentages" method can be applied to conform with a government ruling which prohibits a write-off for the first year greater than twice the straight line deduction. Dr. Gaffney shows how to apply the SP method to conform with this restriction yet still obtain a faster write-off than either the declining balance or the sum of digits methods. The mathematics of these systems, only suggested here, are dealt with comprehensively in Dr. Gaffney's paper.

• **Economic Depreciation**—Present tax laws provide for depreciation to recapture original investment with no allowance made for changing value of the dollar.

"Economic Depreciation" would build up a replacement reserve that would provide for full replacement of the asset at costs prevailing during and at the end of the depreciation period.

• **Cumulative Economic Depreciation**—Dr. Gaffney gives these formulas for cumulative "Economic Depreciation":

Straight Line

$$(1+p)^{y_e}\left[\frac{1-(1+p)^{y}}{1-(1+p)^{y_e}}\right](C_o - C_e)$$

Sum of Percentages

$$(1+p)^{y_e}\left[\frac{1-X^{y}\ (1+p)^{y}}{1-X^{y_e}\ (1+p)^{y_e}}\right](C_o - C_e)$$

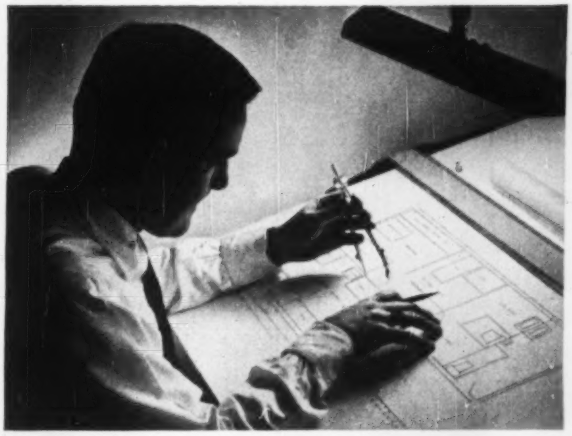
Where p is fractional increase or decrease, with time, in price of an asset

Payout time under "Economic Depreciation" becomes

$$Y = \frac{C_v}{P_n + D} \text{ where}$$

both P_n and D reflect the changing value of the dollar and C_v is undepreciated VALUE of the physical plant.

• **Bulletin F Revision**—Bulletin F, covering depreciation allowances by the Bureau of Internal Revenue, is being updated to reflect changes in tax laws since 1942 when it was last published. To date five informal hearings have been held. But about 150 submissions from industry have been received, a number of whom want to be heard orally. The Supermarket Institute has joined industrial companies in requesting rapid write-off to cover rapid obsolescence.



ARCHITECT: "For an industrial building that's low in cost and yet a credit to my client—this is the material!"

BUILDER: "K&M Corrugated Asbestos can be put up fast, and with regular carpenter's tools."

FIRE UNDERWRITER: "Easy to approve, and often for minimum rates, since it won't burn."

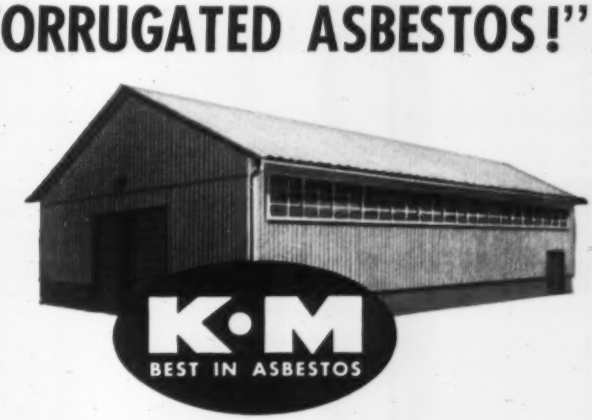
MAINTENANCE ENGINEER: "Practically no upkeep—it won't rust or rot, and needs no protective paint."

"THEY ALL SAID K&M CORRUGATED ASBESTOS!"

"I always specify K&M Corrugated Asbestos because it is sturdy and long-lasting. It stands up under all sorts of weather conditions. It survives where other building materials can't."

Practically indestructible K&M Corrugated Asbestos makes strong, durable roof and curtain walls. It's made of asbestos fiber and portland cement, compressed with tremendous pressure. It fits 101 industrial applications attractively, without the cost of protective paint.

Low first cost, inexpensive construction, long life, and little maintenance make K&M Corrugated Asbestos popular with clients. For more information, write to us.



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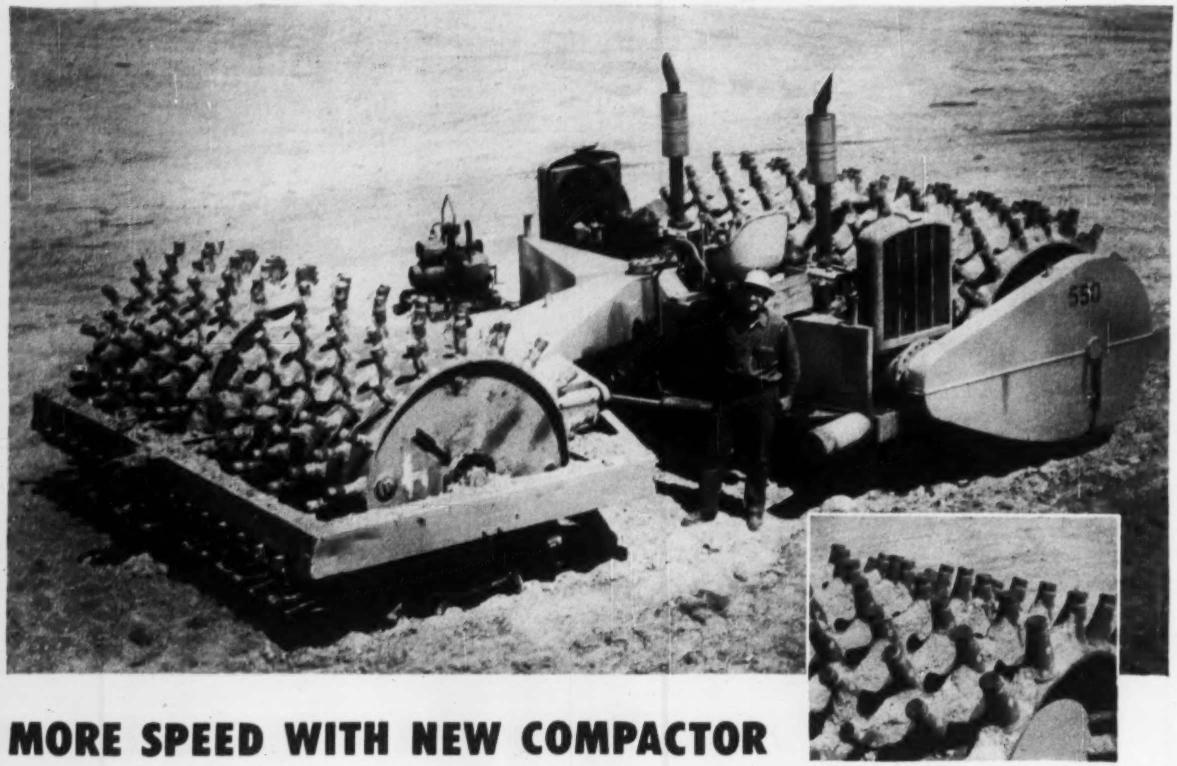


Feet are kept out-to-size and with square edges by a single bead of Stoody 121 applied around the perimeter.

MORE SPEED WITH NEW COMPACTOR

Conventional compactors are not fast enough for the Mittry Construction Co. —so this firm designed and built the double drum monster shown above on a job in Santa Maria, California. Two 200 H.P. diesels drive the machine through torque converters at a speed up to 8 m.p.h.; hydraulic rams operate the steering mechanism. Bare weight is 75,000 pounds; with ballast, 100,000 pounds. This compactor is now doing the work of three ordinary pieces of equipment.

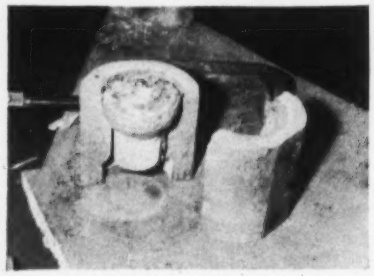
Since speed is the basic reason for this new machine, every factor that keeps it on the job and reduces down-time for repair or parts replacement has been given close consideration. For example, tamper feet might be expected to wear rapidly at high operating speeds; to cut such wear to a minimum the feet were treated to a band of Stoody 121 applied by the semi-automatic welder before the machine went into service. The inset photo above illustrates the appearance of the feet as hard-faced. There will be little "time out" for replacements here!

And on the subject of getting the most out of sheepsfoot tampers—here are two other commonly used methods of restoring worn feet. Both are illustrated at the right. The first method uses short lengths of pipe driven over the worn ends, the "cups" then being filled with deposits of Stoody 121 applied by the semi-automatic welder. This method of weld casting is extremely fast and the ring restores both size and height of the foot. On square shanks the ring may be welded first to close the bottom opening. This method has the advantage of saving time in removing the tamps from the machine.

The second procedure is the use of a split mold, either copper or carbon. The cavity above the stem approximates the original size and shape so the weldor simply fills in with Stoody 121. Gauge is restored automatically. Both methods provide far longer service life at very considerable savings.

The Stoody Guidebook covers hard-facing procedures for all types of heavy equipment. See your Stoody dealer (check the "Yellow Pages" of your phone book) or write direct to the company for a free copy.

Fast repairs result without removing tamps from the machine by driving cups over the worn ends and filling with Stoody 121.



The carbon or copper split-mold surrounds the tamper and forms a cavity which is filled with Stoody 121 by the semi-automatic process.

STOODY COMPANY

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Men and Jobs

Charles E. Daniel . . .

A Construction Man With Sales Appeal

Charles E. Daniel, because he is a rich source of "man who" metaphors, readily qualifies as a toastmaster's delight. But he rarely hears after-dinner praise. He does not spare the time from business to attend such functions.

In the best tradition of self-made men, he progressed from an $18 a week construction worker to chairman of South Carolina's largest general contracting company—one that in 1956 had a total volume of $60 million. The firm, Daniel Construction Co., Inc., of Greenville, also ranks among the largest building firms in the South, operating in all of the southeastern states except Kentucky.

Growth of the company came through the know-how, the driving energy and the farsightedness of its founder.

Charlie Daniel established the firm with $25,000 in borrowed funds at Anderson, S. C., in 1935 after withdrawing as a partner from a lumber and building company. It would not have been described as the best of times to leave an established concern in order to organize a new one. But he knew some answers to the problem of keeping a firm moving in those years of economic stringency.

• A conservative man—He was by nature opposed to government being in business. But although conservative in that respect, he also was practical enough to know that if the government was a source of work for others it also could be a source for his company. For that reason, he obtained all the work possible from the Public Works Administration.

And it was during that period that Daniel Construction Co. started to build a reputation for doing the best work in the shortest possible time. A work completion date on a contract was something to fulfill, and if possible, beat.

The company's activities were not confined to PWA work, however. For in that period it constructed some industrial plants as well as buildings at Clemson College.

Three years after the company was founded it had annual volume of $1 million. So Charlie Daniel decided to open the first branch office—at Birmingham, Ala. And his younger brother, Hugh, who is now president of the company, was placed in charge of the Alabama division. (Branches now are located at Richmond and Jacksonville.)

The company's fortunes flourished, and in 1942 the main office was moved to Greenville.

• Acclaim won—In this same year Charlie Daniel was awarded a construction contract for all the buildings at Donaldson Air Force Base at Greenville. He promised that the job would be done in 90 days. The promise was kept despite bad weather.

Then jobs started to flow to the firm, among them projects at the Charleston, S. C., Navy Yard and the port of embarkation.

By 1945 he had built a solid organization—one whose several hundred superintendents had been trained personally by him during the company's formative years. His foremen and key workers operated as teams, moving from job-to-job together to insure the

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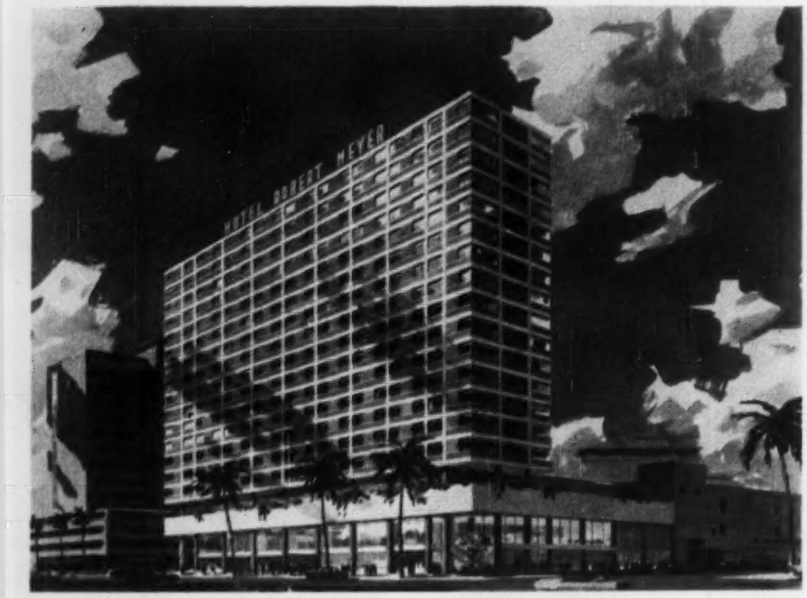
(*Continued from page 339*)



A DANIEL COMPANY JOB at Jacksonville, started in July, is the 510 room, 20 story Meyer Hotel. To cost $6 million, it will be the largest commercial hotel in Florida.

best production and quality. The teams and the superintendents were backed by project supervisors, all engineers.

Up to this time Charlie Daniel had effectively displayed his business talents. But it was from 1945 onward that his firm moved into its greatest prominence. Today it employs approximately 7,000 and has an annual payroll of more than $12 million. Its volume since 1945 amounts to close to $600 million, which represents total capital investment of more than $1 billion.

• The industrial push—Following World War II, Daniel's founder embarked on almost a personal campaign to make South Carolina an industrial state. He had signaled such intentions in earlier years, but the war intervened and denied him full opportunity to exert energies in that direction.

Today, although the company constructs hospitals, churches, schools and office buildings, its specialty is industrial structures. Not only did Charlie Daniel drive hard to get industrial work, but he probably was responsible for convincing many firms to locate plants in the state. His personal meetings with industrial executives usually turned out to be the means of winning both a client for the firm and an industry for South Carolina.

He also had much to do with development of laws that would appeal to business men seeking a place in which to expand or relocate. He knew that the state required industry in order to balance its faltering agricultural economy.

Favoring the southeastern states as an industrial locale were vast quantities of inexpensive land, lower construction costs, low cost power, a good climate and a favorable labor picture. All of these South Carolina also possessed. But Charlie Daniel decided to improve its natural and economic advantages by working for state laws that would supplement them.

Convinced that the governments of the northern states were taxing their industries too heavily either through hostility or indifference, he started a post-war drive to create legislation favorable to industry in his state. He was supported by other influential residents of South Carolina.

• Objective reached—In the long run, the construction company head saw his objectives accomplished.

South Carolina has a right-to-work law. It has a state sales tax that pays school costs. (Prior to the sales tax, education was paid for out of county property taxes, a levy that fell most heavily on industry.)

Furthermore, the sales tax law was written so as to specifically exempt manufacturing machinery and materials used in processing of finished goods. Thus, the tax burden on industry was not merely shifted from one shoulder to another. It was genuinely eased all down the line.

Assessment burdens are also light. Theoretically, new buildings are assessed at about 42% of value, but in practice it works out to 10% or 12% because all equipment installed and all construction provided for the benefit of workers are tax exempt. Such exemptions include air conditioning, rest rooms, cafeterias, locker rooms and other similar facilities. In addition, a franchise tax that weighed most upon out-of-state corporations was revoked.

When selling an industrialist on South Carolina, the construction executive carefully notes all of these facts. But he also points out another advantage—the labor factor.

• State's labor advantage—South Carolina holds some advantage over adjacent southern states because its labor force is not as thoroughly organized. Labor claims only 7% unionization of industrial workers in the state.

With respect to his own firm's labor policy, Charlie Daniel says: "We always try to operate under existing conditions. We believe in the right of a man to join a union. However, we believe just as strongly in his right not to join a union."

He adds: "We don't ask whether or not a man is a union member. We don't think it's any of our business."

The advantages of existing conditions, however, are neatly tucked away in his memory—and he makes use of all of them to obtain a contract for his company and new industry for his state.

• Moves fast—Daniel's board chairman is not one to delay a project or an idea. If he hears of a company that is considering expansion or relocation, he travels swiftly to its executive offices armed with facts and figures about South Carolina.

He has an uncanny ability in spotting prospects and, after making the contact, his sales ability comes into full play. So successful has he been in obtaining new plants for South Carolina that the governor of a neighboring state possessing an able research and development board once remarked that he would "trade the entire group for one Charlie Daniel."

His desire to further the prosperity of South Carolina is a compelling one and does not always rest on obtaining a construction contract from a company planning to expand in the south or South Carolina. For example, he

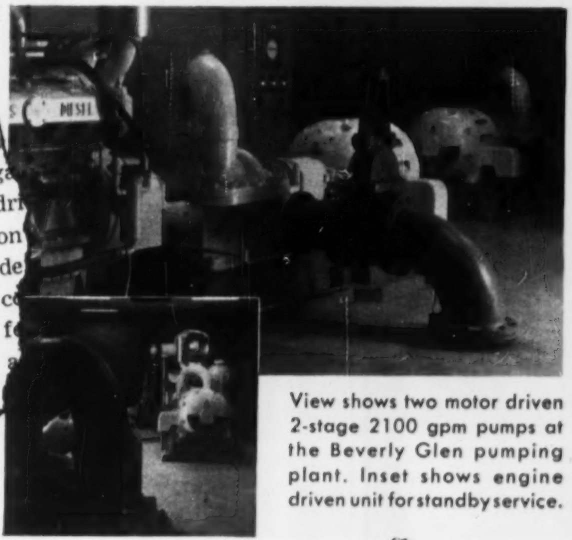
(*Continued on page 342*)

PUMPING HEADlines

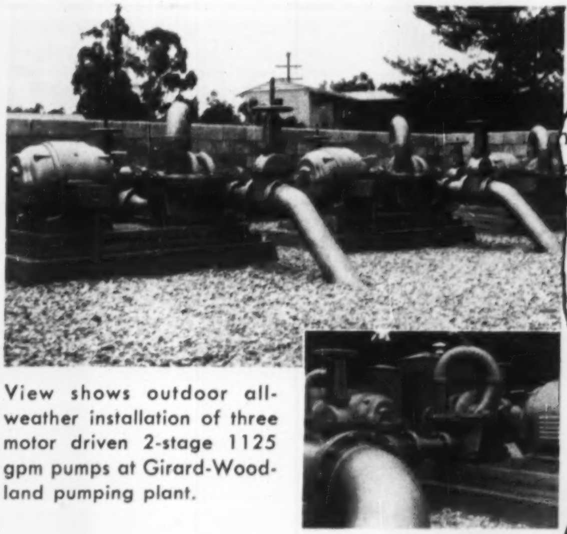
By Peerless Pumps

ON THE JOB FOR THE LARGEST MUNICIPALLY-OWNED UTILITY IN THE UNITED STATES—THE DEPARTMENT OF WATER & POWER OF THE CITY OF LOS ANGELES—PUMPING FROM RESERVOIR LINES INTO ELEVATED TANKS

510 FEET is the lift imposed on these 2-stage Peerless pumps. Two of the three 350 hp motor driven units can handle up to 6,000,000 gallons a day from inlet lines into an elevated storage tank of 2¼ million gallons capacity. The third unit, an engine driven pump, also rated at 350 hp, comes on in case of power failure and pressure demand. All three pumps are automatically controlled, starting and stopping being effected by pressure and flow controls. Pumps are designated as Peerless Type 8TU17.



View shows two motor driven 2-stage 2100 gpm pumps at the Beverly Glen pumping plant. Inset shows engine driven unit for standby service.



View shows outdoor all-weather installation of three motor driven 2-stage 1125 gpm pumps at Girard-Woodland pumping plant.

245 FEET is the head on these three Peerless 2-stage Type 5TU15 pumps. Like the units above, these pumps also handle water from a reservoir inlet line, lifting it into an elevated tank, in this case of 1 million gallon capacity. The three pumps have a capacity of up to 3,000,000 gallons a day.

For dependable, efficient pumping select and install versatile Peerless horizontal centrifugal pumps.

Mail the coupon below for illustrated and descriptive Bulletin.

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ENR

(*Continued from page 340*)

worked hard and used all his influence to get the du Pont company to build an Orlon plant in the state. He did this despite the fact that he knew du Pont handled its own construction work and, therefore, no work or profit would accrue to the Daniel firm.

Charlie Daniel is not lacking in the profit motive, however. He works hard to get a job for his company, whether it be one in his own state or elsewhere.

Some of the nation's top commercial and industrial companies are numbered among Daniel clients. Currently, the construction firm is putting up an $80 million plant in Sheffield, Ala., for Reynolds Metals Co.; an $80 million plant at Pensacola, Fla., for Chemstrand Corp. and a $10 million plant for Kohler Co. at Spartanburgh, S. C.

- **Complete confidence**—The Daniel company's relations with employers are excellent. Clients not only have faith in Daniel work, but also in Charlie's judgment and honesty.

The latter quality is best illustrated by the fact that there have been several instances where the construction company worked without a contract—prices and fees were spoken of only after the job was done. For instance, it built 10 plants and renovated 15 others for Deering Milliken with only a verbal agreement, the value of work being in excess of $20 million. It also has operated on a similar basis with Wellman Combing Co., J. P. Stevens Co. and Textron.

Charlie Daniel does not rest on his laurels, however. Although his company has an impressive list of clients, he would like to obtain others. To accomplish this—and also to be able to visit jobs in progress more frequently—he now makes use of a twin engine airplane owned by his company.

The plane may set a faster pace for Daniel's founder. But it is only another instrument which keeps him on the move in the forefront of company business and South Carolina industrial growth.

Martin Is Named Director Of IBM Planning, Building

Nathaniel M. Martin

Nathaniel M. Martin has been named director of facilities planning and building construction for International Business Machines Corp. He succeeds Ray F. Boedecker, who was appointed administrative assistant of the office of the superintendent in the IBM data processing division.

Mr. Martin holds a B.S. Degree from the U. S. Military Academy and a Masters Degree in Civil Engineering from Massachusetts Institute of Technology. He has specialized for 20 years in the design and construction of engineering projects ranging from dams to aircraft assembly plants.

As a colonel in the Army from 1949 to 1954, Mr. Martin was engineer in charge of new construction in France and the Wurtemburg-Baden area of Germany. Prior to joining IBM, he was on the faculty of the Army War College at Carlisle Barracks, Pa.

Construction Firm Head Elected a Bank Trustee

William L. Crow, president of William L. Crow Construction Co., New York City, has been elected to the board of trustees of the Union Square Savings Bank, also in New York.

Mr. Crow has headed the construction company since 1936. He was graduated from Princeton University and during World War II served with the Army Engineers as a major. At present, he is also a director of the construction company, a trustee of the United States Trust Co. of New York and a member of the graduate council of Princeton University.

William L. Crow

Research Engineer Joins Highway Users Conference

Ralph D. Johnson, former research engineer with the Montana State Highway Department, has joined the National Highway Users Conference as assistant engineering counsel.

Before entering highway work in Montana, he was employed for six years by the U. S. Department of the Interior on the Alaska Road Commission. He also has served as industrial engineer for Vancouver, B. C.

Mr. Johnson was graduated as a civil engineer from the University of British Columbia.

Corps Field Employee Gets Highest Civil Service Rate

Frank S. Brown, chief of the engineering division of the North Pacific Division, Corps of Engineers, has become the first Army Engineer employee in the field service to receive a civil service rating of GS-16. The only other such ratings in the Army Engineers are in the Office of Chief of Engineers, Washington, D. C.

Before joining the North Pacific Division in 1952, Mr. Brown supervised design of Chief Joseph Dam on the Columbia River, Albeni Falls Dam on the Pend Oreille River and a wide variety of military construction as chief of the engineering division of the Seattle District.

A. L. Reed Takes Over Albuquerque District

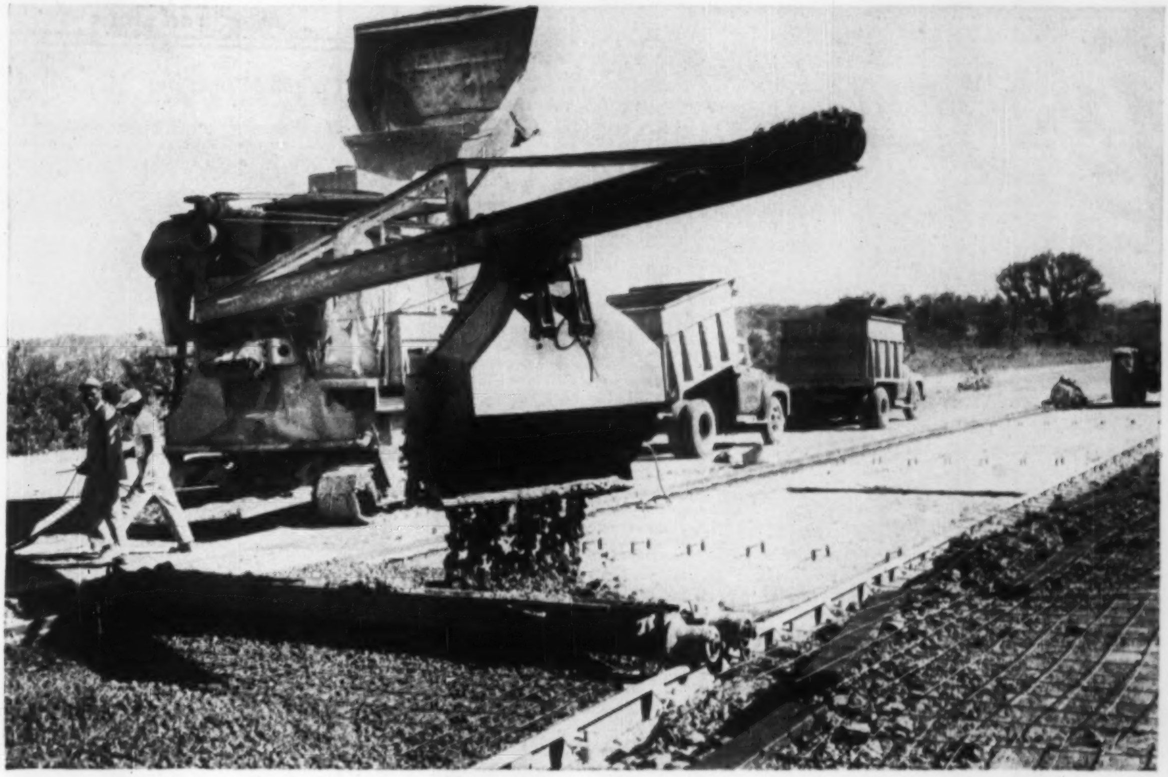
Col. Albert L. Reed has been assigned as District Engineer, Albuquerque District, Corps of Engineers, replacing Col. Robert E. Cron, Jr., who has retired from active service.

Colonel Reed comes to his new post from the Armed Forces Special Weapons Project at Kansas City, Mo., where he had been serving as Midwest engineer and construction officer.

Conforti Is New President Of Construction Company

James Conforti, Jr., formerly chief engineer and treasurer of William L. Crow Construction Co., New York City, has become president of the John H. Eisele Co., also of New York. He succeeds the company's founder, John

(*Continued on page 344*)

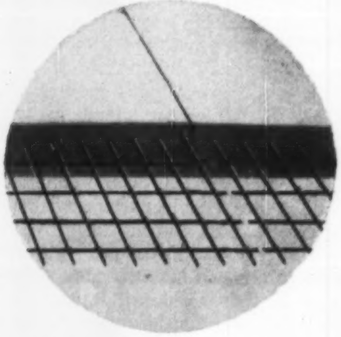


Backbone of strength for highways with a future

SHEFFIELD

ARMCO

Welded Wire Fabric



Whether you need the extra strength of steel for a home driveway or a super highway, it will pay you to use Sheffield Welded Wire Fabric.

Above you see a highway starting life with a long future of better service, smoother riding, greater safety, less maintenance. One important reason: this road is being built with a backbone of steel — Sheffield Welded Wire Fabric.

Sheffield Welded Wire Fabric teams up with concrete and other roadbuilding materials to take the punishment of today's — and tomorrow's — multiplied traffic, heavier loads, and higher speeds. This backbone of steel defends against natural enemies, too — extremes of weather and temperature.

Here is how Sheffield Welded Wire Fabric makes a better road:

- **Distributes load evenly throughout the slab**
- **Minimizes cracking. When cracks do develop, they're held tightly together to prevent serious damage**
- **Provides greatest resistance to breaking, spalling or "pumping"**
- **Fewer joints contribute to easier riding and save taxpayers' money through reduced maintenance costs and longer service life**

As the national highway building program rolls into high gear, Sheffield's production of new Welded Wire Fabric and Crescent Reinforcing Bars is keeping pace — with adequate supply and fast delivery. Get in touch with your nearest Sheffield office.

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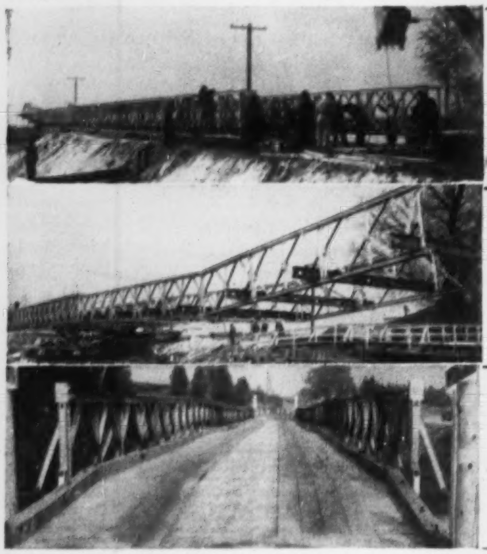

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Simple launching system cuts equipment costs.

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Photographs by courtesy of Bailey Bridge Section, Department of Highways, Ontario.

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(Continued from page 342)

James Conforti, Jr.

H. Eisele, who is now chairman of the board of directors.

Mr. Conforti is both an attorney and a professional engineer, and studied law at Fordham and Temple Universities and engineering at New York University. He learned the construction business as an apprentice in various building trades, including carpentry, masonry and plastering.

Prior to World War II he was a vice president of Union Construction Co. of New York City, in a partnership with his father. The company became inactive when the younger Mr. Conforti enlisted in the Navy Seabees.

After four years of Seabee service, he was discharged as a lieutenant commander and joined the architectural firm of Voorhees, Walker, Smith & Smith. In 1949 he became associated with the Crow company.

Careers

Business

Lynn M. Miller has joined the staff of Jones, Henry & Williams, consulting engineers of Toledo, Ohio. Assistant chief of the water resources section of the Michigan Department of Conservation for the last eight years, Mr. Miller will concentrate on water supply projects in his new connections.

Carl L. Erb has been admitted as a partner in the consulting engineering firm of Howard, Needles, Tammen & Bergendoff. Mr. Erb will be placed in charge of the firm's office in Cleveland, Ohio.

Michael N. Salgo has assumed duties as director of design and construction in the facilities engineering services department of the Columbia Broadcasting System in New York City. Mr. Salgo, who was with the U.S. Navy in civilian capacity, is at present a vice president of the Metropolitan Section, American Society of Civil Engineers.

William C. Denison has been made a vice president of American Brake Shoe Co., New York City. He is also president of Brake Shoe's Denison Engineering Division.

Maj. Gen. C. Rodney Smith, former Deputy Chief of Engineers, Corps of Engineers, has become a vice president of the International Standard Electric Corp., a subsidiary of International Telephone & Telegraph Corp. Making this move upon his retirement from the Army, General Smith assumes charge of the subsidiary's contract with Supreme Headquarters, Allied Powers in Europe, to engineer and install the command communications network extending from northern Norway to eastern Turkey.

Education

John F. Brookes, professor of civil engineering at the University of Oklahoma, has retired from active teaching. Also a practicing civil engineer, his field of specialization is heavy construction as related to stream canalization.

Associations

Floyd F. Schraeder, a Louisville engineer, has been elected chairman of a three-state council of the American Society of Civil Engineers. The council represents eight local sections of the society in Kentucky, Indiana, and Ohio. Mr. Schraeder is Kentucky district engineer of the Water Resources Division of the U.S. Geological Survey.

S. A. Dansyear of Miami, Fla. has been elected president of the executive officer's Council of the National Association of Home Builders.

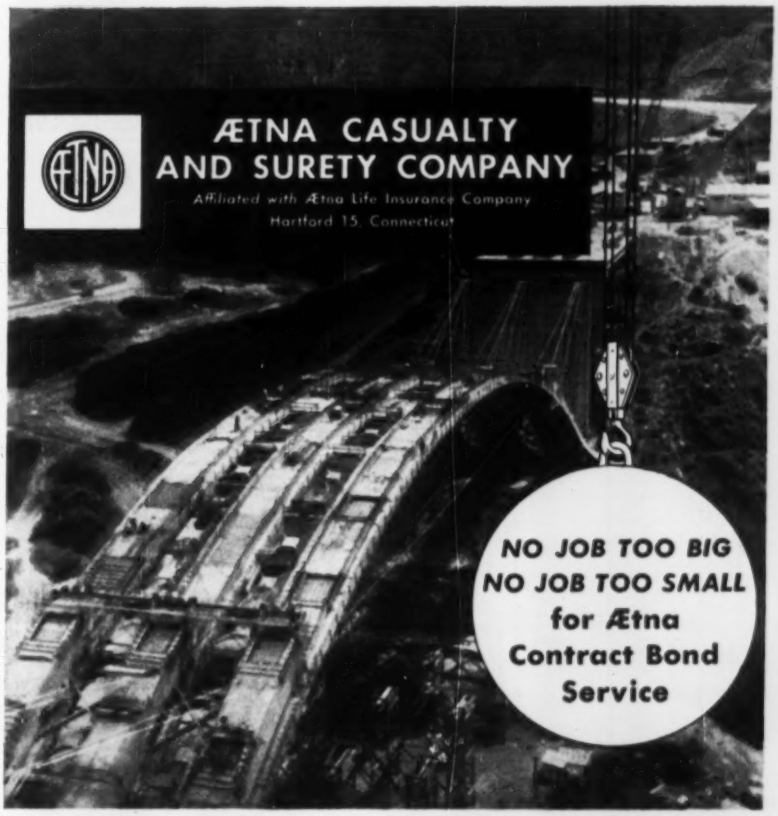
James E. Clyde of O'Brien & Gere has been elected president of the Syracuse, N. Y., section of the American Society of Civil Engineers.

Public Works

Joseph B. Graves, Jr., has been appointed executive secretary of the National Committee of the Voluntary Home Mortgage Credit Program. He will succeed **Fred B. Morrison** who resigned to enter private business. Mr. Graves will start his duties Oct. 7.

Cyrus B. Sweet has been promoted to the position of deputy commissioner of the Federal Housing Administration. He succeeds **Charles E. Sigety** who resigned. Mr. Sweet was assistant FHA commissioner for operations.

Karl S. Brown is the director of the newly created post of director of public affairs in the Urban Renewal Administration.



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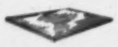
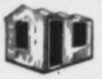

9:15 a.m. Floor Down

9:40 a.m. 3 Walls Up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10:30 a.m. Ready to use

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ECONOMY Construction Buildings are available in many sizes to satisfy any space requirements. Buildings over sidewalks on skids, L to R, 10x12' ($364.60), 10x16' ($475.80), 10x24' ($698.20) F.O.B. West Chicago, Illinois.

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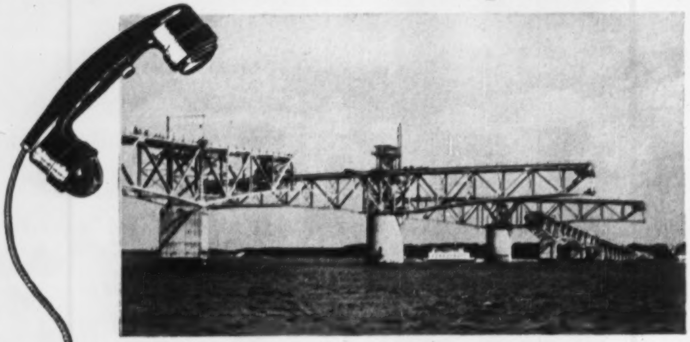

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Obituaries

Louis F. Vaile, 77, a highway and railroad building engineer in California and Alaska, died in Sacramento, Sept. 14. A civil engineering graduate of Yale University, Mr. Vaile began his career with Western Pacific Railroad. In 1912 he joined the California Highway Commission engineering staff and worked on the first state highway from San Francisco to Los Angeles. Later, in Alaska he was an engineer in railroad and highway construction. He returned to California to operate an engineering firm in Vacaville for 15 years.

Jacob J. Wiggand, retired president of the contracting firm of J. Wiggand & Sons, Albany, N. Y., died Sept. 15.

Clifford G. Moon, a civil engineer who worked on the Welland Canal, died at his home in St. Catherines, Ont., Sept. 13. He had worked with the Ottawa city engineer's staff and later with the Canadian Pacific Railway in Vancouver, B. C. He retired in 1955.

Hoyt R. Crabaugh, 40, acting chief engineer for the Los Angeles County Air Pollution Control District, died recently at Long Beach. With the district since 1948, he was also serving as assistant director of the district.

Nelson R. Buckley, civil engineer, died Sept. 9 in Cleveland. Mr. Buckley was for many years chief engineer of the fabricating department of The Austin Co. He was president of Structural Drafting Service, Inc., until a year ago. He was also secretary-treasurer of Trygve Hoff & Associates, Cleveland engineering firm.

William R. Martin, 61, industrial engineer, died in Manila Aug. 16. Mr. Martin, a retired army colonel, specialized in steel and railway construction, directing projects for American Steel Foundries, Inc., in all parts of the world.

Duncan R. St. Clair, 95, retired builder, died Sept. 15 in Charlotte, N. C. He built many industrial plants in the South, and later specialized in church and university construction.

Harold H. Haaker, 63, architect and housing authority, died in Dallas Sept. 13. He received degrees from the Universities of Omaha and Illinois. For the last five years he had been with the Corps of Engineers in Dallas.

Carl N. Anderson, 66, consulting engineer, died Sept. 15 in Portland, Ore. He was a graduate of Oregon State College and Massachusetts Institute of Technology.

Julius I. White, 76, retired civil engineer, died Aug. 26 in Durham, N. C. In 1925, as superintendent for E. H. Clements Construction Co., he supervised construction of the west campus of Duke University and later served in a similar capacity during construction of the university's east campus.

Henry L. Kennedy, 60, authority on concrete, died Sept. 10 in Cambridge, Mass. At the time of his death he was sales manager of the construction specialities department of Dewey & Almy Chemical Co., Cambridge.

Mr. Kennedy pioneered the use of grinding aids for the efficient manufacture of partland cement and air-entraining agents to improve durability of concrete. He was president of the American Concrete Institute in 1953-54 and a director of the ACI for several years.

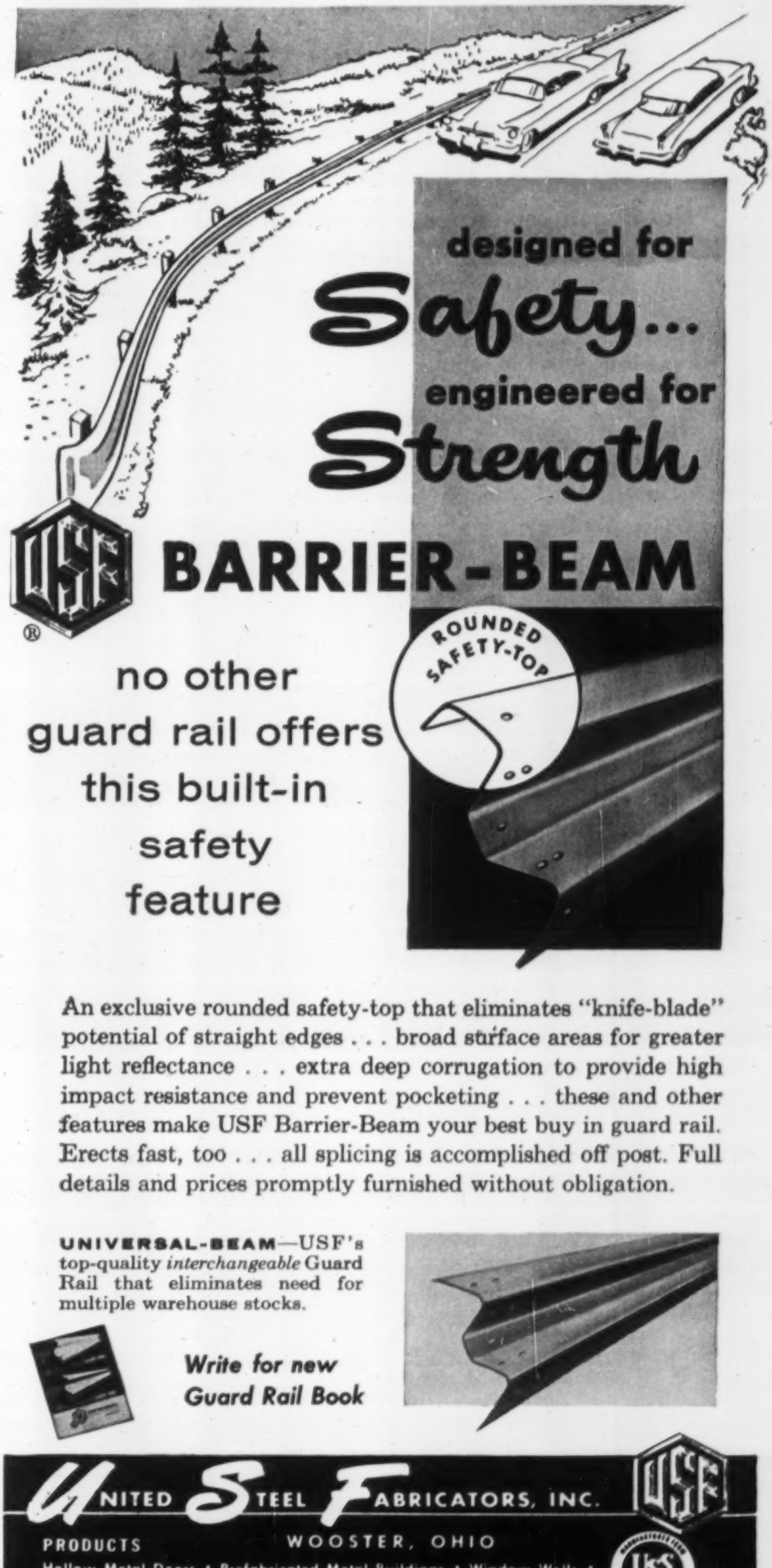
Mr. Kennedy studied architectural engineering at Northeastern University, construction at Wentworth Institute and did graduate work at Beaune University in France. He lectured at Wentworth Institute for 12 years, at Franklin Technical Institute and at Harvard Graduate Engineering School.

Col. Carl H. Jabelonsky, 78, retired Army engineer, died Sept. 3 in Denver. Colonel Jabelonsky supervised construction of Fitzsimons Army Hospital, later was in charge of construction for Lowry Air Force Base and Buckley Naval Air Station, all in Denver. After retiring in 1943 as district engineer at Denver for the Corps of Engineers, he was appointed Denver building inspector.

Newton L. Hinkson, 44, hydroelectric engineer and vice president of Bleifuss, Hostetter & Associates, consulting engineers, died Sept. 5 in Los Altos, Calif. He spent more than 16 years of his engineering career with TVA, Harza Engineering Co., International Engineering Co. and Bechtel Corp. He was a graduate of Kansas State College.

Marcus M. Doerhoefer, 71, who retired last May from his post as an engineer with the Kentucky State Highway Department, died in Louisville, Sept. 7.

James D. Peek, 54, of Fallston, N. C., assistant division engineer for the North Carolina Highway Department, died Aug. 30.



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Test Track to Torture Tires

Goodyear sets up multi-million dollar test track in Texas; program calls for building 32½ miles of roads

A multi-million dollar proving ground for tires is to be built by The Goodyear Tire & Rubber Co. at San Angelo, Texas—about 220 miles southwest of Ft. Worth.

The facility, which will be the largest of its kind in the rubber industry, will include a banked 5 mile high-speed circle, a meandering 20 mile paved figure-eight, a 2½ mile tractor tire straightaway, a 5 mile wandering gravel road and a headquarters building. The circle will accommodate speeds to 160 mph.

The test site, a trapezoid in shape, covers 7,300 acres of rolling ranchland 14 miles northeast of San Angelo.

Current planning calls for the 5 mile test circle to be built first, followed by the headquarter buildings, 20 mile figure-eight, tractor tire straightaway and gravel road, in that order.

• **160 mph speeds**—The test circle, designed for speeds up to 140 mph without side force and capable of handling runs up to 160 mph, will be banked to an elevation of 7 ft. Profile for the track will be the concave arc of a circle. The roadway will be 30 ft in width, the track 1.6 miles in dia and 5 miles in circumference. It will be made of compacted crushed rock aggregate topped with macadam. Location will be the northeast section of the proving ground.

The 20 mile figure-eight, designed to simulate sustained driving conditions, also will be made of compacted crushed rock topped with macadam. It will include six 2 mile straightaways and banked curves ranging from 90 to 215 deg. A two-lane road 24 ft wide, the figure-eight layout will balance left and right hand turns. Two bridges and an underpass will be built.

The tractor testing strip, which is to be a 2½ mile long paved straightaway, will be used for tread wear studies. The 5 mile gravel road will wind around the ground's rolling surfaces southeast of the high-speed circle. Its 24 ft roadbed will permit terrain tests.

• **Headquarters** — The headquarters building, outlying maintenance facility, service station and parking lot will occupy approximately 70,000 sq ft in the southwest corner of the proving ground.

The headquarters building, consisting of four wings, will include general offices, first aid room, kitchen, dining facilities, report room, shower and locker rooms, passenger car tire changing facilities, repair, lubrication and wash racks and a machine shop. One wing will be set up as a receiving and storage section; another will be a drive-through tractor-trailer repair and maintenance station. The overall facility will cover 45,000 sq ft.

The outlying garage will be equipped to repair and house ground maintenance equipment. Included in its 13,000 sq ft of floor space will be room for additional tire and vehicle storage.

Bordering the figure-eight will be the comfort, check and filling station. Above-ground fuel facilities will be located there to store and dispense more than 30,000 gal of gasoline and diesel fuel. Adjacent to the station will be a water tower.

The three buildings will be made of steel framing, aluminum siding, corrugated plastic, block, stone coping and face brick. A parking lot, large enough to accommodate 150 vehicles, will be located near the main headquarters building.

For Lab or Field Use

Hand-operated compactor prepares soil samples

A low-cost, hand-operated kneading compactor has been developed at the Institute of Transportation and Traffic Engineering of the University of California, Berkeley, which can prepare soil specimens either in the laboratory or in the field. Tamping pressures up to 500 psi for a 4 in. dia specimen and up to 225 psi for a 6 in. dia specimen can be applied by the new equipment.

Most engineers now recognize that the kneading method of compaction approximates closely the action actually produced in the field by sheep's-foot and rubber-tired rollers. Laboratory methods have involved static compaction by confining the soil in a mold and gradually increasing the pressure on the ends or the impact compaction by dropping a weight a number of times on the surface of the soil. But, soils compacted by these methods do not have the same properties as soils compacted by kneading—the building of pressure on a small area of the soil to a definite value, maintaining it a moment and releasing it.

The design principle used in this hand-operated compactor is similar to that of the Harvard miniature compactor developed in 1950 (ENR Nov. 2, 1950, p 34). But unlike the Harvard compactor, which, because of its small size is intended for use with soils having a maximum grain size of ⅛ in., the newly developed compactor may be used in standard pavement design procedures. Until now, some machine like the Triaxial Institute Kneading Compactor requiring compressed air was necessary to prepare soil samples. The new manual compactor, on the other hand, may be operated in the field, where air might not be available. Furthermore, the cost of the manual equipment is considerably less than the mechanical types.

A modified arbor press forms the main part of the unit with a spring between the ram and the tamping foot that adjusts to the desired tamping pressure. The sample is compressed in a mold mounted on a rotating base that is turned through 1/6 revolution between tamps. A signal light is activated when the operator has applied the preset pressure.

On the basis of tests conducted at the soil mechanics and bituminous materials laboratory of the university, it is believed the hand-operated kneading compactor can satisfactorily reproduce the compaction effects of the mechanical compactors.

Further details of the new equipment are given in ITTE Circular No. 27, by Prof. Harry B. Seed, associate research engineer at the institute, who was in charge of the development. Copies of the circular are available without charge from the Institute.

Conversion of Salt Water By A-Power Heat Studied

A contract to analyze theoretically the economics and technical feasibility of using nuclear energy either as a heat or electrical power source in saline water conversion distillation processes has been awarded by the U.S. Department of the Interior, through the Office of Saline Water.

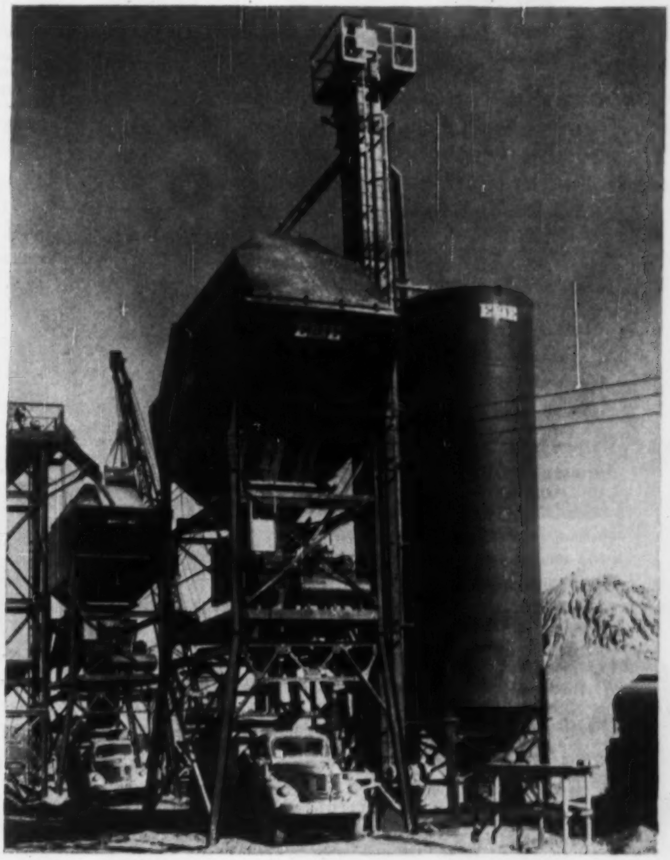
The approximately $25,000 contract has gone to the Fluor Corp., Ltd., Los Angeles, Calif., whose research division will carry out the study at Whittier, Calif.

ERIE'S NEW UNITIZED BATCH PLANT SPEEDS SETUP-KNOCKDOWN TIME FOR CONTRACTOR ON ILLINOIS TOLL HIGHWAY

"Greatly simplifies moving and erection. Electro-pneumatic automatic beam scale fast and dependable,"

says Dave Stein, paving superintendent, CKG Associates.

Close-up of Erie Strayer's Unitized Deck with its batching equipment and operating components. Unitized Deck also available for Truck Mixer Plants.



Erie Strayer 3-compartment aggregate bin with 3 automatic batchers; 850 bbl. cement bin with 2 cement batchers.

TO QUOTE Mr. Stein more fully: "We find that moving and erecting are greatly simplified by the unitized construction of our new Erie Strayer plant. And the fully automatic operation of the automatic beam-type scales is rapid, dependable and within the Illinois Toll Highway specifications."

You, too, can expect these same benefits. They're engineered into every Erie Strayer Unitized Plant.

EASY KNOCKDOWN: Each of the 4 units is self-contained. Lifts off clean. No parts dangling or protruding. Road handling is easy.

QUICK ERECTION: Simply put one section on top of the other, tighten a few bolts. All wiring and air piping is done at the factory. Just couple the electric lines and air hoses quick connectors.

DEPENDABLE ACCURACY: Control system of Erie Strayer's Unitized Deck is equipped with electro-pneumatic automatic beam scales that are dependably accurate. They meet superhighway specifications and are rugged enough to take the rough handling a portable plant gets.

With easy portability you're always close to the pouring site. Short hauls cut delivery time. Require fewer batch trucks. Faster batching equipment gives you more batches per day; this adds up to lower costs and more profit.

For information on this and other types of streamlined Erie Strayer Equipment, write for detailed booklet. It's free.

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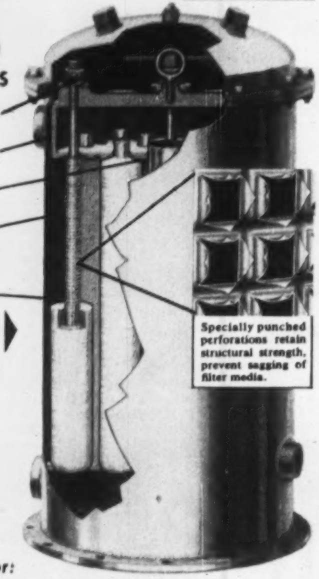

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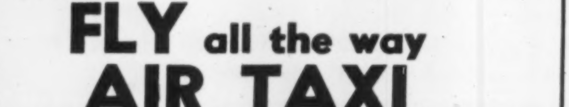

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Books

Religious Buildings

Religious Buildings for Today—An Architectural Record Book, 183 pp. F. W. Dodge Corp., New York, N. Y. $7.50.

Some 70,000 churches and synagogues will be constructed or substantially altered at a cost of nearly $6 billion during the next decade; another $1.3 billion will be spent on some 12,500 projects involving parish houses, Sunday schools and related buildings, according to estimates included in this book.

Along with this increase in spending comes a revival of interest in church architecture. There is a growing concern by architects and laymen that the design of houses of worship reflects contemporary needs and takes "forms suitable to the purposes of the buildings and to the time and place in which we build them."

This book is geared primarily for architects, and building committees interested in contemporary church design, but it also offers engineers an insight into the structural aspects of current and coming church construction.

The book surveys recently proposed and completed religious buildings, most of them in the U.S., a few in Europe and Asia. Churches of major religious denominations are described by text, photographs and drawings. Case studies include interior and exterior illustrations and floor plans.

They range in scope from a reinforced concrete chapel, designed to seat 50, that rises from a spur of red sandstone at the base of a 1,500 ft vertical cliff set in the rugged Arizona terrain, to an unconventional design for the new English Coventry Cathedral to replace the one bombed out. Also included is the windowless cylindrical chapel at Massachusetts Institute of Technology.

A variety of sites, budgets, design characteristics, uses of new structural materials and unusual uses of old are shown. Effective employment of light, space, color and texture are described. Both the human and structural requirements are explored.

Essays by churchmen, secular authorities and architects analyze some of the religious traditions and peculiar distinctions that should be incorporated in religious structures of particular faiths. "Good Architecture for the Church," "Worship and the Arts," "Structural Expression," and "Today's Church School" are among the subjects discussed.

Miscellaneous Notes

• **Wood identification**—The Forest Service of the U. S. Dept. of Agriculture has prepared a new handbook for identification of different kinds of wood. Full-color illustrations of 32 woods, actually representing more than 60 species, include end grain, edge grain and flat grain surfaces of the same species. Eighteen hardwoods and 14 softwoods are described and pictured. The handbook, entitled "Wood: Colors and Kinds," is available for 50 cents a copy as Agricultural Handbook 101 from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

• **Gas pipelines**—The Federal Power Commission has announced availability of a June 30, 1957 revision of its map of "Major Natural Gas Pipelines" in the United States. The 13 x 18 in. map is printed in five colors and shows major operating pipelines, those under construction, those which have been authorized and not yet started, and proposed lines which are pending Commission action. Existing or proposed pipeline systems of 126 companies are represented. In addition, the map shows the location of natural gas fields, indicating both major sources and generalized areas of supply. Copies may be purchased from the Federal Power Commission, Washington 25, D. C., at 25 cents each.

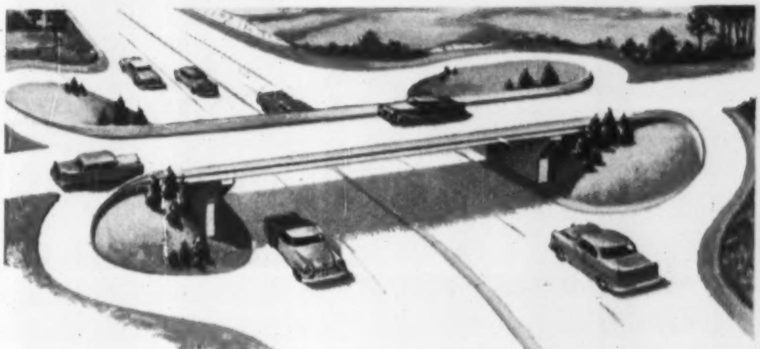
• **Earthquake design**—A selected bibliography on earthquake-resistant design lists publications on seismology, magnitude and intensity of earthquakes and engineering applications, as well as building codes, insurance codes and reference sources. The bibliography may be obtained by writing the American Institute of Steel Construction, 101 Park Ave., New York 17, N. Y.

Books & Pamphlets

SURVEYING—Second edition. By Charles B. Breed. 495 pp. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $5.50.

MODERN MATHEMATICS FOR THE ENGINEER—by Edwin F. Beckenbach. 514 pp. McGraw-Hill Book Co., 330 W. 42nd St., New York 36. $7.50.

BIOLOGICAL TREATMENT OF SEWAGE AND INDUSTRIAL WASTES—393 pp. Reinhold Pub. Corp., 430 Park Ave., New York 22. $10.00.



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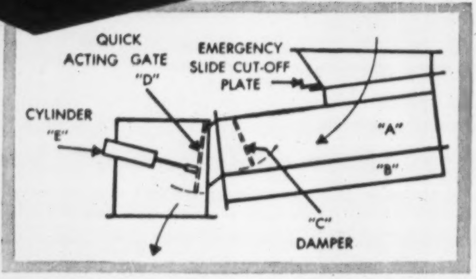

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Surety's Claim Superior to Creditor's

When a surety pays claims against contractor for labor and materials, the surety has prior claim on funds due

A surety who agrees to pay the claims incurred by a contractor for labor and materials and to whom the contractor assigns the money due under a contract receives, under New York law, an interest in the contract proceeds superior to that of a judgment creditor for unpaid premiums on workmen's compensation and public liability insurance policies.

The rule was applied in a recent New York case that stemmed from a New York City contract for school construction.

When the contractor found itself unable to pay for labor and materials, it asked the surety to discharge these obligations. It assigned to the surety all money due under the contract. The surety paid the claims and received assignments of the mechanics liens that had been filed. Later, a creditor received judgment against the contractor for unpaid premiums on workmen's compensation and public liability insurance.

Subsequently, the judgment creditor sought to satisfy its judgment out of the money still due from the city under the contract and unsuccessfully sought to prevent the city from making payments directly to the surety pursuant to the assignment made by the contractor in the case.

The court held that the rights of the surety were superior to those of the judgment creditor and refused to prohibit the city from making payments directly to the surety.

The court stated: "The Court of Appeals of this state has held that in this type of case, under the principle of subrogation, the surety's rights are prior to those of claimant's in the position of the judgment creditor. United States Fidelity & Guaranty Co. v. Triborough Bridge Authority, 297 N. Y. 31, 74 N. E. 2d 226; Scarsdale Nat. Bank & Trust Co. v. United States Fidelity & Guaranty Co., 264 N. Y. 159, 190 N. E. 330; also see American Lumbermans Mutual Casualty Company of Illinois v. Great Atlantic Construction Corp., Sup., 158 N. Y. S. 2d 115, Hecht, J.

In so holding, the court in the Triborough Bridge Authority case, where the facts were very similar to those in this case, quoting from the Scarsdale Nat. Bank case, said 297 N. Y. at page 35, 74 N. E. 2d at page 227:

". . . Plaintiff succeeded—under principles of subrogation to all rights which defendant Authority might have against the contractor, including that of withholding money due the contractor and of applying it to the payment of unsatisfied claims for labor and materials furnished. As this court (per Crane, J.), clearly demonstrated in the Scarsdale case, supra, the equity in the surety's favor arose at the time it gave its bond, although the right *became available and enforceable* when it carried out the contract's provisions; it was there said (264 N. Y. at page 164, 190 N. E. at page 332): 'However, we are here dealing with a contract to retain earned moneys and apply them on the cost of any completed work. To all rights under this contract the bonding company was subrogated. The equity in favor of the surety company *arose* at the time of the giving of its bond. The right *became available* when the surety company completed the work at a loss. Prairie State Bank v. United States, 164 U. S. 227, at pages 232, 237, 240, 17 S. Ct. 142, 41 L. Ed. 41. The equitable lien arose at the time of the execution of the bond and was thus superior to the assignment. Exchange State Bank v. Federal Surety Co., 28 F. 2d 485, 488. This is the reasoning and the rule adopted by the weight of authority'."

"I am also satisfied," the court said, " that the rights created by the contractor's assignment to the sureties were sufficient to bar the judgment creditor from any claim against the moneys due to be paid by the city under its contract. It is elementary that a judgment creditor can have no greater rights to the property involved than those owned by the judgment debtor at the time of the commencement of supplementary proceedings. Eisenberb v. Mercer Hicks Corp., 199 Misc, 52, 101 N.Y.S. 2d 662, 664. The assignment herein created an equitable ownership in the sureties as to the fund payable for the construction work to be done by the contractor. Under such circumstances, as between the parties, the fund in equity passes immediately to the assignee, so that if the assignor should thereafter collect the fund, it would be under obligation to pay it over to the assignee. Thus an attaching creditor stands no better that his debtor and if such debtor has no equitable interest in the property the creditor acquires nothing by an attachment. This is true whether the fund is in being or not at the time of the assignment. Seamon v. Federated Films, City Ct., 142 N.Y.S. 2d 324, 329, and cases there cited.

"It further appears that within the purview of the Lien Law the judgment of the judgment creditor is not lienable, since it was not based upon the performance of labor or the furnishing of materials for construction. For that reason the rights of the sureties, arising from the mechanics liens of which they are the assignees having paid the claims of the subcontractors for the labor and materials upon which the same are based, are prior to those of the judgment creditor, certainly to the extent of the amount paid out to the owners of the mechanics liens, which far exceeds the $7,500 held subject to the third party subpoena.

"See Corbin-Kellogg Agency, Inc. v. Tasker, 248 App. Div. 58, 289 N. Y. S. 156."

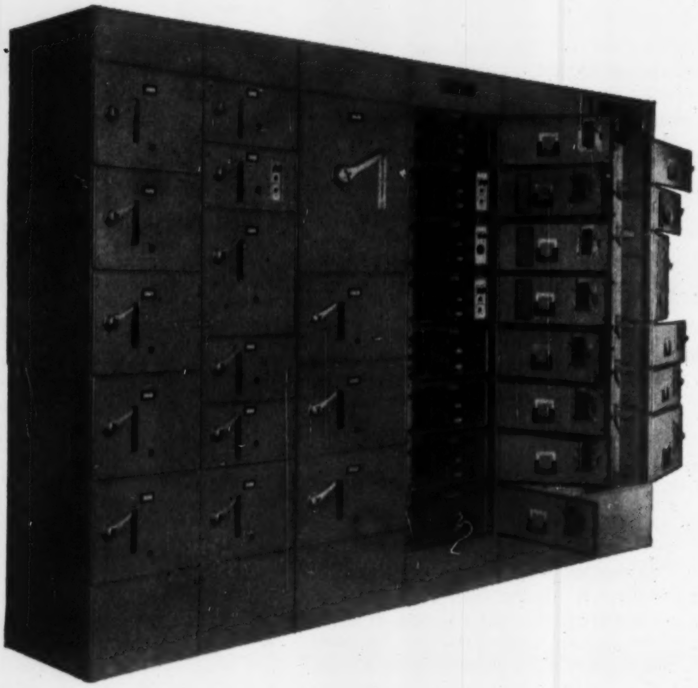
(1) United States Casualty Co v. Met Contracting Corp., 158 N.Y.S. 2d 117, Supreme Court of New York, New York County, Nov. 8, 1956.

Defective Performance And Measure of Damages

Ordinarily, the damages recoverable for defective performance is the cost of remedying defects. However, in some cases, where the defects are of such a nature that to correct them would require demolition and reconstruction of a substantial part of the building, the courts have held that the correct measure of damages is the difference in value of the building as erected and what its value would have been had it been erected in accordance with the plans and specifications.

In a recent Texas case, a homeowner brought an action against a building contractor for damages for breach of a construction contract. In order to remedy the alleged defects and deviations from the plans and specifications, the expenditure of large sums of money would have been required. It would have been necessary to rebuild the foundation of the building, to tear down brick veneer and rebuild it with

(Continued on page 354)



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(Continued from page 353)

better materials, to rebuild the den and remove and replace tile in the bathroom. There was no evidence to show that the contractor intentionally deviated from the contract. Under such circumstances, the court held,[1] the correct measure of damages was the difference in value, if any, between the house as constructed and its value had it been constructed according to the contract.

(1) Hutson v. Chambless, 300 S.W. 2d 943, Supreme Court of Texas, Apr. 3, 1957.

Limit on Indemnity

Sub held not responsible for another's negligence

A subcontract clause making the subcontractor responsible for all damages or injuries resulting from the execution of the contract does not make the subcontractor liable for injuries caused by the negligence of someone other than the subcontractor, its agents or employees.

In a recent federal case, the court refused to give unlimited scope to an idemnity clause in a subcontract. The case involved a contract for construction of a building in Rhode Island. Turner Construction Co., the general contractor, subcontracted the steel work to W. J. Halloran Steel Erection Co.

During the progress of the work, Turner, as general contractor, arranged for the services of a portable crane and its crew of two men, one of whom was Houlihan, to hoist wet cement from the ground to the roof of the building. Turner procured the services of an iron worker employed by one of its other subcontractors on the project to act as "tag-man" by giving signals from the roof to the crane operator below to guide him in maneuvering the bucket of wet cement over a hopper on the roof into which it was emptied. The crane operator, thinking from a signal given by the "tag-man" that a bucket of cement had been emptied when in fact it had not, swung the bucket clear of the building and started to lower it to the ground for another load, but its unanticipated weight caused it to fall to the ground out of control and strike Houlihan, causing him serious injuries.

Houlihan brought actions both against Turner and White Plains Iron Works, Inc., the latter being the employer of the signal man whose negligence caused the accident. The actions were tried together by a jury which found that Houlihan's injuries were caused by the negligence of the signal man, who at the time of the accident was not an employee of the White Plains Iron Works, but was working for Turner with the result that Houlihan obtained a judgment against the Turner company and his action against the White Plains Iron Works was dismissed.

Houlihan was injured on Mar. 23, 1953. On the next day Turner executed a written change order adding the work of hoisting wet cement to the roof to a contract it had previously made with the W. J. Halloran Steel Erection Co. wherein the latter had agreed to furnish the tools, labor, materials, etc. necessary for the work of installing "deformed reinforcing steel bars and wire mesh."

After Houlihan brought his action against Turner and White Plains Iron Works, Turner brought a third-party action against W. J. Halloran Steel Erection Co., claiming that the latter was liable to it for whatever amount might be adjudged against it in favor of Houlihan. Turner rested its claim upon its contract with Steel Erection, which provided: "The subcontractor hereby assumes entire responsibility and liability in and for any and all damage or injury of any kind or nature whatever to all persons, whether employees or otherwise, and to all property growing out of or resulting from the execution of the work provided for in this contract or occurring in connection therewith, and agrees to indemnify and save harmless, Turner, its agents, servants and employees from and against any and all loss, expense including attorney's fees, damages or injury growing out of or resulting from or occurring in connection with the execution of the work herein provided."

The action of Turner against W. J. Halloran Steel Erection Co. was tried with the actions by the injured party against Turner and White Plains Iron Works and the trial court directed a verdict for Steel Erection from which verdict Turner appealed. The judgment was affirmed on appeal.

The judgment of the trial court was based on two grounds:

(1) That there was no evidence to show that the injury resulted from any negligence on the part of Steel Erection Co. or of any of its agents or employees. The court construed the indemnity provision of the contract to apply only to damages that resulted from negligence on the part of Steel Erection or its employees and did not apply to injuries or damages that resulted from

(Continued on page 358)

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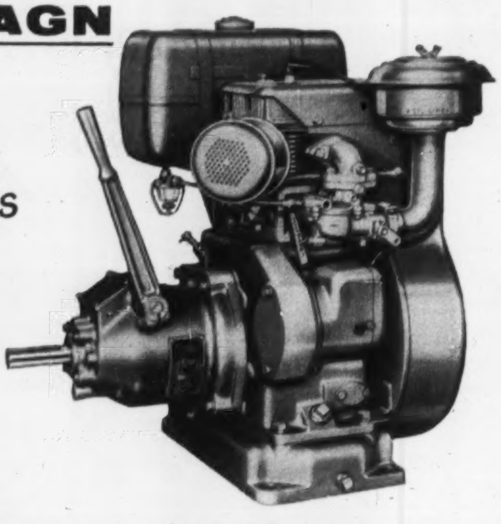

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(Continued from page 357)

negligence on the part of Turner or others. Steel erection had nothing to do with the work that caused the injury.

(2) The court said "it can hardly be supposed that a sub-contractor would readily assume so sweeping a liability. Indeed, the likelihood of a sub-contractor undertaking such broad liability is so remote that only an unequivocal manifestation of intent by the use of clear words to that effect would warrant the conclusion that he had actually done so. Standard Oil Company of Texas v. Wampler, 5 Cir., 1955, 218 F. 2d 768, and cases cited.

"We do not find such words in the indemnity clause quoted earlier in this opinion."

(1) Turner Const. Co. v. W. J. Halloran Steel Erection Co., 240 F. 2d 441, U. S. Court of Appeals, First Circuit, Jan. 22, 1957.

Law Doesn't Allow Owner To Prevent Performance

The law is well settled that one party to a contract cannot deny the other party the agreed compensation by preventing him from performing the contract.

The rule was followed earlier this year by a Missouri court, which had this situation before it: The contract was for repairs to a dwelling house. After the contractor had completed the work, he demanded payment that was refused by the owner who claimed that certain parts of the work had been performed in an unworkmanlike manner. The contractor told the owner that he was willing to correct any defects in the work, but the owner notified the contractor that he would not permit him to come back to the job or do any more work on it. The contractor was allowed a recovery which was affirmed on appeal.

"The law," the court said, "is well established that where a party to the contract forbids its performance by the other, or interferes with its performance by the other to an extent which amounts to a refusal of performance, the party thus interfered with may recover as if he had performed the contract."[1]

(1) Reid v. Kelley, 300 S.W. 2nd 542, Kansas City Court Appeals, Missouri, Apr. 1, 1957.

These summaries of court decisions are prepared by I. Vernon Werbin, New York attorney and civil engineer.

Construction Reports

Bids Asked—Low Bidders—Contracts Awarded—

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York 36, N. Y., ELSIE EAVES, Manager
J. A. MAHONEY, M. WETZEL, M. E. SCIORRA, D. TARTAGLIA, Reports
J. H. WEBBER, M. R. ROESSLER, E. R. HUBER, Statistics.

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▲ **Mass., Boston**—BA 10/24—Commonwealth of Mass., Metropolitan Dist. Comn., Constr. Div., 20 Somerset St., Contract 252, distr. lines from Shaft 9A-tunnel extension, incl. laying, connecting approx. 13,880 ft. pipe, Malden-Medford. $2,000,000. Plans deposit $25.

† **R. I., Quonset Point**—HOSPITAL WING—BA 10/24—Pub. Wks. Office, Bldg. No. 438, U. S. Naval Air Station, repair and alter Wing No. 3 of Station Hospital Bldg. No. 8 for outpatient clinic at Naval Air Station, NBy 14273, Spec. No. 14273/57. CD 8/28/56.

BUILDINGS—BA

Mass., Salem — HOUSING — BA 10/24 — City, Salem Housing Auth., 16A Rainbow Terrace, housing for the Eldery-The Willows. $450,000. Plans deposit $25. John J. Mahoney Assoc., 61 Jefferson Ave., archts. CD 4/4.

▲ **Mass., Haverhill**—HOSPITAL—BA 10/25—City, Supt. Bldgs., City Hall, 3 story, brick Hale Hospital addn., alterations, Buttonwood Ave. $1,000,000. Plans deposit $75. Clinton F. Goodwin, 25 Washington Sq., archt. CD 7/14/55.

▲ **Mass., Northboro**—SCHOOL—BA 11/7—Northboro & Southboro Regional School Dist., c/o Supt. Schools, Howard St., Regional High School, near Southboro Town line. $2,000,000. Plans deposit $100. Alderman & MacLeish, 594 Riverdale St., West Springfield, archts. CD 12/7/56.

BUILDINGS—SLC

Mass., Arlington — OFFICES — Yukon Realty Co., 430 Mass. Ave., Arlington, Mass., soon lets contract 128x204 ft. 2nd floor addn. to existing garage for offices. Approx. $350,000. New England Telephone & Telegraph Co., 185 Franklin St., Boston, Mass., lessee. Kendall, Taylor & Co., Inc., 12 Norfolk St., Cambridge, archt.

Mass., Auburn—FACTORY, etc.—Lodding Engineering Corp., 73 Beacon St., Worcester, soon lets contract factory and office bldg.; Auburn Industrial Center. $600,000. Doak Martin, 8 Norwich St., Worcester, archt. CD 9/12.

Mass., Holyoke—SUPERMARKET, etc.—Rainer Realty Trust, 503 D St., South Boston, soon lets contract 60,000 sq. ft. Supermarket and Department Store Bldg. $600,000. Stop & Shop, Inc., 393 D St., S. Boston, Mass. and J. M. Field Store, lessees.

HEAVY CONSTRUCTION—LB & CA

▲ **MASSACHUSETTS**—Commonwealth of Mass., Dpt. P. Wks., 100 Nashsua St., Boston, Bids opened 9/24, Mass.—**Callan Constr. Corp.**, 539 Hope St., Providence, R. I., LB **$891,163**, est. $1,045,234, state hy. constr. connecting Rte. 6 to Horseneck Beach, FAS-114(1) Westport;

Mass.—**Gino Rugani, Inc.**, Pleasant St., Marshfield, Mass., LB **$81,329**, est. $79,780, reconstr. Section Pearl St., Braintree.

BUILDINGS—LB & CA

▲ **Carroll, Verge & Whipple Inc.**, 370 Wahconah St., Pittsfield, Mass., LB **$1,066,561**, HIGH SCHOOL, South Monkton Rd., VERGENNES, VT. Union High School Dist., Lloyd Moulton, supt., Vergennes, Vt. Bids Oct. 2. CD 9/19.

Alton Builders, Inc., 1645 Warwick Ave., Warwick, R. I. LB **$340,000**, Public Works GARAGE, etc. off Wall St., ATTLEBORO, MASS. City, Attleboro, Supt. P. Wks., Part St., Attleboro, Mass. Washburn & Luther Assocs. and James S. Rowley, 7 North Main St., Attleboro, Mass., archts.

Graziano Constr. Co., 71 Adams St., Quincy, Mass., CA Approx. **$345,000**, RESIDENTIAL DEVELOPMENT "Washington Park" 17 houses, Holmes St., BRAINTREE, MASS. Owner, c/o Contractor.

Julian Cassoli Constr. Co., 842 Washington St., Quincy, Mass. Separate Contracts, **$345,000**, RESIDENTIAL DEVELOPMENT "Shaded Acres", 22 houses on Cross Rd., BRAINTREE HIGHLANDS, MASS.

Owner, c/o Belford Assocs., 321 Woburn St., Lexington, Mass., Separate Contracts, approx. **$700,000**, 2 RESIDENTIAL DEVELOPMENTS "Hemlock Lane", 26 houses, "Sunnycrest", 14 houses, BURLINGTON, MASS.

N. K. White Co., Inc., 40 Court St., Boston, Mass., LB **$392,000**, est. $345,000, East Elementary SCHOOL—B. J. Golden SCHOOL—EAST WOBURN, MASS. City, P. Wks. Supt., City Hall, Woburn, Mass. Bids Oct. 1. CD 9/25.

Owner, c/o A. J. Skene, 477 Washington St., Norwood, Mass. Separate Contracts. **$352,000**, RESIDENTIAL DEVELOPMENT "Rolling Green Ridge" 22 houses, 1½ mi. from Franklin Square, FRANKLIN, MASS.

Sawyer Constr. Co., Inc., Blanchard Rd., Burlington, Mass., CA **$935,885**, East Intermediate SCHOOL, off Boardman St., HAVERHILL, MASS. City, Haverhill, Dpt. P. Bldgs., City Hall, Haverhill, Mass. CD 9/26, under LB.

Frank Losordo Sons, Inc., 276 Quarry St., Quincy, Mass., CA Approx. **$360,000**. RESIDENTIAL DEVELOPMENT, "Stonehurst," 18 houses, Tower Brook Rd., HINGHAM, MASS. Owner, c/o Contractor.

Thodore Loranger & Sons, 404 Nash Rd., New Bedford, Mass., CA Approx. **$350,000**, PAROCHIAL SCHOOL, NEW BEDFORD, MASS., Immaculate Conception R. C. Church; Chancery Office, 394 Highland Ave., Fall River, Mass. Joseph M. Mosher & Son, Inc., 77 Washington St., Providence, R. I., archt.

J. Slotnik Co., 99 Chauncy St., Boston, Mass., CA **$598,000**, HOSPITAL addn., alterations, NEWTON, MASS. Newton-Wellesley Hospital, 2014 Washington St., Newton, Mass. Bids Aug. 21. CD 8/27, under LB.

▲ **Leonard Rugo, Inc.**, 30 Huntington Ave., Boston, Mass. LB **$1,190,000** (combined bids) two elementary SCHOOLS, one at Nichols St. and other at Neponset St., NORWOOD, MASS. Town, Supt. Schools, Norwood Junior High School Bldg., Bond St., Norwood, Mass. Bids Oct. 3. CD 9/18.

Frank Briguglio, 422 Summer Ave., Reading, Mass., CA Approx. **$345,000**, RESIDENTIAL DEVELOPMENT, Cherry Lane Drive, 20 ranch houses, READING, MASS. Owner, c/o contractor.

Owner, c/o Dial Realty Co., 387 Harvard St., Brookline, Mass. Separate Contracts. Approx. **$350,000**, RESIDENTIAL DEVELOPMENT, 25 houses, Oak St., SHARON, MASS.

† **Alexander Schnip & Sons, Inc.**, 107 Forest St., Norwich, Conn., LB **$294,938** (4 bidders) Enlisted Men's RECREATION BLDG., addn., U. S. Naval Submarine Base, NBy 10237, Spec. 10234/57, GROTON, CONN. Dist. P. Wks., Third Naval Dist., Federal Office Bldg., 90 Church St., New York, N. Y. Bids Sept. 26.

P. Francini & Co., Inc., Water St., Derby, Conn., LB **$829,700** (9 bidders) Proj. BI-R-132, AUDITORIUM, GYMNASIUM and CAFETERIA, Eli Whitney Regional Technical School, HAMDEN, CONN. State P. Wks. Dpt., 165 Capitol Ave., Hartford, Conn. Bids Oct. 2. CD 9/5.

E. & F. Constr. Co., 94 Wells St., Bridgeport, Conn., CA **$545,878** (6 bidders) JUNIOR-SENIOR HIGH SCHOOL, MONROE, CONN. Town, School Bldg. Comn., Monroe Town Hall, Monroe, Conn. Bids Sept. 11, awarded Oct. 3. CD 8/22.

PROJECTS COVERED

By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterways $44,000; other public works $73,000; industrial buildings $93,000; other buildings $344,000. Also Foreign projects of $100,000 and more in size of interest to American contractors.

By Regions & Classes of Construction

(In order of Listing)

BIDS ASKED
LOW BIDDERS
CONTRACTS AWARDED

New England
Middle Atlantic
South
Middle West
West of Mississippi
Far West

PROPOSED WORK
Water Supply
Sewers, Waste Disposal
Bridges
Streets & Roads
Earthwork, Waterways
Public Buildings
Mass Housing
Commercial Buildings
Industrial Buildings
Unclassified

In These Stages

PROPOSED WORK: Before and including appointment of engineers or architects.
BIDS ASKED: BA (new announcements only). For full calendar, see also preceding issues.

SOON LETS CONTRACT: SLC

LOW BIDDERS: LB On jobs below $500,000 in value all low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: CA Except awards to low bidders previously reported in low bidder stage.

CD dates shown are of Construction Daily Issue in which last previous report was published.

OWNERS, ENGINEERS, ARCHITECTS, CONTRACTORS are invited to report their new jobs for listing in these reports when they meet or exceed the size minimums shown above. Address these news releases to J. A. Mahoney, REPORTS, ENGINEERING NEWS-RECORD, 330 W. 42 St., New York 36, N. Y.

Symbols and Abbreviations Include:

†	Federal Government
▲	Project of $1,000,000 or over.
ENR	Engineering News-Record
CD	Construction Daily

For additional reports see Construction Daily.

Caddy Holding Corp., Nursery St., Norwalk, Conn. Owner Builds. **$416,000**. 32 HOUSES, Douglas Dr., NORWALK, CONN. CD 9/12.

MIDDLE ATLANTIC

HEAVY CONSTRUCTION—BA

† **New York and New Jersey**—ATHLETIC COURT FACILITIES—BA 10/24—U. S. Eng., 111 E. 16 St., New York, N. Y., athletic court facilities, at AAA sites, ENG-30-075-58-73, $200,000. James P. O'Donnell, 329 Broadway, New York, N. Y., engr. CD 9/26.

BUILDINGS—SLC

Pa., Derry—BUILDING ADDN.—Westinghouse Electric Corp., 3 Gateway Center, soon lets contract 1 story 6,500 sq. ft., S. Bldg. addn. $600,000.

▲ **Pa., Pittsburgh** — PLANT — Westinghouse Electric Corp., Gateway Center, soon lets contract 1 story, 26x202 ft., steel frame lean to addn. G-Bldg. West Mifflin. $1,500,000. CD 5/25/56.

Pa., Shiremanstown—GRAIN ELEVATOR—Eastern Grain Co., Bourse Bldg., Phila., soon lets contract, grain elevator, $750,000. Bradbury & Szalay, 4216 College Ave., Indianapolis, Ind.; and Campbell Harris, Inc., 19 N. Front St., Harrisburg, Pa., consult. engrs. Wilfred P. Sutton, c/o owner, staff engr.

HEAVY CONSTRUCTION—LB & CA

Balport Constr. Co., 15 Park Row, New York, N. Y., CA **$169,050**. sewers, laterals, etc. in Washington Heights Sanitary Sewer Dist., Town of Walkill, CIRCLEVILLE, N. Y. Town Bd. at office, Harry C. Carpenter, engr. 4 Fairlawn Ave., Middletown, N. Y. Bids Aug. 30. CD 8/6, under N. Y., Walkill,

John C. Peterson Constr. Corp., 958 Church St., Baldwin, N. Y., LB **$444,296** (3 bidders) Contr. B-485-H, imprv. Merrick Rd., Freeport from point 230 ft. east of Grove St. easterly to point 50 ft. east of Cleveland Ave., Town of Hempstead by paving curb, sidewalks, drainage and other appurtenances approx. 4200 ft. MINEOLA, N. Y. Comr. P. Wks., Nassau Co., Old County Court House, Mineola, N. Y. Bids Sept. 25. CD 7/16/56.

MARYLAND—State Rds. Comn., 108 E. Lexington St., Baltimore, Zone 2,

M. J. Grove Lime Co., Lime Kiln, Md., LB **$155,368** (5 bidders), hy. bridge on Frederick By-pass, near Frederick, Frederick Co.

Mahoney Bros., Knickerbocker Bldg., Baltimore, Zone 2, Md., LB **$163,778** (6 bidders), Hy. Contract 1480 S.A. sheet asph. paving, BALTIMORE, MD. City of Baltimore, Bureau Hys., 303 Municipal Bldg., Baltimore 2, Md. Bids Sept. 25. CD 9/19.

BUILDINGS—LB & CA

Rockafellow Constr. Co., State Hy. 79, Matawan, N. J., CA **$500,000**, enlargement and modernization of HEADQUARTERS on Main St.; 4 story structure will be renovated and added to; 3rd floor to be remodeled for a meter dept; 2 receiving truck bays to be added and hydraulic lift installed, ALLENHURST, N. J., Jersey Central Power & Light, 501 Grand Ave., Asbury Park, N. J., Bernard Kellenyi, 17 Linden Place, Red Bank, N. J., archt.

Sylvan Constr. Co. (Hartstein & Koggan), 146 Ewingville Rd., Trenton, N. J., CA **$400,000**, split-level HOMES Parkside Ave., new section of Sherbrooke Manor, EWINGVILLE, (TRENTON P.O.), N. J. Harold Hartstein & Monroe Koggan, 146 Ewingville Rd., Trenton, N. J.

▲ **Gorovoy Assocs.**, 13-46 Sperber Rd., Fair Lawn, N. J., Own Forces, **$1,250,000**, 37 HOMES, Moodland Rd. and Grant Ave. to be known as Montvale Acres, MONTVALE, N. J.

Highland Manor Homes, 17 N. Spruce St., Trenton, N. J., Separate Contracts, **$350,000**, RESIDENTIAL DEVELOPMENT, Prospect Highlands, TRENTON, N. J.

Glazer & Stein, 1708 Race St., Phila., Pa., Owner Builds. **$650,000**. 46 HOUSES, Spruce St., to be known as Highland Manor, Ewing Twp., TRENTON, N. J.

▲ **Leonard Roth**, 282 Trenton Ave., Paterson, N. J. Owner Builds. **$1,000,000**. 32 HOUSES, Balston Dr. off Lakeside Ave., VERONA, N. J. Pete Grygotis, 306 Aldene Rd., Roselle, N. J., archt.

▲ **Joseph A. Cicconi**, c/o Pine Lake Development Co., Lake Dr., Pompton Lakes, N. J., CA Est. **$1,600,000**, 56 HOUSES, Indian Rd., WAYNE TWP. (MOUNTAIN VIEW P.O.) N. J. Robert C. Flynn, operating as Pine Lake Development Co., Box 346, Pompton Lakes, N. J., Walter C. Pfeiffer, 109 Washington St., Morristown, N. J., archt.

Andrew A. Faull, 1011 Linwood Ave., Collingswood, N. J., CA **$350,000**, DORMITCRY, CHAPEL, SHOP BLDGS. and SUPERINTENDENTS RESIDENCE, WHITING, N. J. Keswick Colony of Mercy, Whiting, N. J. Horace W. Castor, 117 S. 17 St., Phila., Pa., archt.

Bristol Terrace Homes, Beaver Dam and Magnolia Rds., Bristol, Pa., Separate Contracts. **$344,000**, 360 HOUSES alterations, repairs, BRISTOL, PA.

▲ **Spera Constr. Co.**, 1719 N. Front St., Harrisburg, Pa., CA **$1,061,142** general construction NURSES RESIDENCE near present hospital, HARRISBURG, PA. Harrisburg Hospital, S. Front St., Harrisburg, Pa. Bids Sept. 17, awarded Oct. 2. CD 9/26 under LB.

Holland Manor Homes, c/o S. W. Schrenk, Holland, Pa., Separate Contracts. **$350,000** RESIDENTIAL DEVELOPMENT, Holland Rd., HOLLAND, PA.

Roanoke Constr. Co., c/o owner, Phila., Pa., CA **$500,000**, STORE, PHILA., PA. W. Stuempfig & Co., 45 Maplewood Ave., Phila., Pa. Seears Roebuck & Co., leesee.

Mike Leebov, 4609 Winthrop St., **Pittsburgh 13, Pa., CA $451,732**, 26,555 sq. ft. ELEMENTARY SCHOOL south side of PITTSBURGH, PA. City, City Hall, Pittsburgh, Pa. Rigaumont & Steem, 5471 Coral St., Pittsburgh 6, Pa., archts. Awarded Sept. 23.

▲ **Arundletown, Inc.**, 14 W. Saratoga St., Baltimore 1, Md., Separate Contracts, **$4,000,000**. SHOPPING CENTER, masonry, steel, concrete-plate glass store fronts at Harundale-Ritchie Hy. and Farrington Rd., GLEN BURNIE, MD. Rogers-Taliaferro & Lamb, 18 West St., Annapolis, Md., archts.

▲ **John Tester & Son, Inc.**, Clinton, Md., CA **$1,635,000**. 5 story, limestone STUDENT RESIDENCE HALL, 125 Michigan Ave. N. E., WASH., D. C. Trinity College, Michigan Ave. and Franklin St. N. E., Wash., D. C. Gaudreau & Gaudreau, 330 N. Charles St., Baltimore, Md., archts. CD 9/21/56.

SOUTH

HEAVY CONSTRUCTION—BA

† **Florida**—BA 10/25—U. S. Eng., Box 4970, Jacksonville, imprv. Canal 7 (Little River) Central & Southern Florida Control Proj., CIVENG-08-123-58-22. CD 10/3.

† **Louisiana**—BA 10/29—U. S. Eng., foot of Prytania St., New Orleans, Zone 9, approx. 1,200 sq. yd. levee restoration and 805 sq. yd. concrete slopes pavt. Deer Range Levee, Plaquemine Parish, Inv. 58-60.

† **VIRGINIA**—BA 10/29—Bureau Pub. Rds., Dpt. Commerce, 1440 Columbia Pike, Arlington,

Fairfax Co.—Proj. 1A11, George Washington Memorial Parkway, 4 span prestressed concrete girder superstructure, 170 ft. length to carry two 36 ft. roadways, on concrete abutments with 940 cu. yd. Class A concrete, etc. H. J. Spelman, regional engr.; adv. ENR 10/17.

La., **Marrero**—BA 10/30—Jefferson Parish Water Works, Dist. No. 2, Marrero, 10 m.g. water filtration plant, new raw water intake line and appurtenances, incl. administration bldg. Plans deposit $50. T. Edw. Ernst, 822 Perdido St., New Orleans, engr.

La., **Alexandria**—BA 11/4—City Council, Alexandria, underpass at crossing on Monroe St. and Texas & Pacific Ry. Plans deposit $50. Pan American, 1022 Tenth St., engr.

† **Fla.**, **Homestead**—CATHODIC PROTECTION—BA On Or About 11/6—U. S. Eng., P.O. Box 4970, Jacksonville, cathodic protection (FY-56) Homestead Air Force Base, ENG-08-123-58-11. CD 9/19.

† **Ga.**, **Brunswick**—BLEACHERS, etc.—BA 11/12—Dist. P. Wks. Office, Bldg. No. 13, U. S. Naval Base, Charleston, S. C., bleachers, dressing room and lighting for softball field, U. S. Naval Air Station, Blynco, NBy 10439, Spec. 10439/57 Rev. CD 9/19.

BUILDINGS—BA

S. C., **Abbeville** — SCHOOL — BA 10/22 — Abbeville County School Dist. 60, Abbeville, high school. Plans deposit $50. Lyles, Bissett, Carlisle & Wolff, 1321 Bull St., Columbia, archts.

▲ **Ga.**, **Athens**—HOUSING, etc.—BA 10/24—City of Athens Housing Auth., Social Bldg., Broad St., 130 unit low rent housing, maintenance and administration bldgs. Plans deposit $75. Kuhlke & Wade, 16 Campbell Bldg., Augusta, archts.

▲† **Ga.**, **Macon**—HOUSING UNITS—BA 10/29—Directorate of Procurement & Prod., Bldg. 1678, Robins Air Force, Macon, 273 housing units, Robins Air Force Base. Jas. C. Wide, 873 Spring St. N.W., Atlanta, archt. CD 9/18.

Ala., **Birmingham**—SCHOOL—BA 10/30—Bd. Educ., 2015 7th Ave. N., Northern High School for Negroes. $500,000. Plans deposit $25. Charles McCauley, Jackson Bldg., archts. CD 3/20.

BUILDINGS—SLC

Fla., **Pensacola**—SCHOOL—Diocese of Mobile, Msgr. Leo M. Byrnes, supt. Schools, 404 Government St., Mobile, Ala., soon lets contract Catholic High School. Hart & Leitch, 10 Spring St., archts.

La., **Mansura**—SCHOOL, etc.—St. Paul Roman Catholic Parish, Mansura, soon lets contract Parochial School and Convent Bldg. Price & DeKeyzer, 718 Main St., Pineville, archts.

HEAVY CONSTRUCTION—LB & CA

† **T. E. Ritter Corp.**, 426 West York St., Norfolk, Va., LB **$738,531** (4 bidders) replacement of LP PARKING area, Naval Air Station, NBy 11054, Spec. 11054/57, NORFOLK, VA. Pub. Wks. Office, 5th Naval Dist., U. S. Naval Base, Norfolk 11, Va. Bids Oct. 1. CD 9/24.

† **Tidewater Constr. Corp.**, 538 Front St., Norfolk, Va., CA **$288,000**. Bid Item No. 1, CA **$250,000**. Bid Item No. 2, modernization of Dry Dock No. 1, Charleston Naval Shipyard, NBy 13958, Spec. 13958/57, CHARLESTON, S. C. Dist. P. Wks. Office, 6th Naval Dist., U. S. Naval Base, Charleston, S. C. Bids Aug. 29. CD 7/22.

▲ **Murphy Constr. Co.**, Clare Ave., West Palm Beach, Fla., LB **$1,315,295 (A)**; LB **$946,835 (B)**, water pump station and force main, St. Lucie River, WEST PALM BEACH, FLA. Air Products Inc., 949 Hamilton St., Allentown, Pa. Bids Aug. 20. CD 8/21.

▲† **Walter P. Villere Co.**, 4405 River Rd., New Orleans, La., LB **$1,005,553** (3 bidders) Amite River tributaries, diversion channel consisting of removal and satisfactory disposal of approx. 5,844,000 cu. yd. material and clearing 4 mi. upstream from Lake Murepas, Livingston Parish, Inv. No. 58-30, LOUISIANA. U. S. Eng., foot of Prytania St., New Orleans, La. Bids Sept. 27. CD 9/10.

A. M. Mutersbaugh, P.O. Box 1540, Lake Charles, La., LB **$313,117**, storm drainage imprvs. and other drainage facilities, LAKE CHARLES, LA. Gravity Drainage Dist. No. 4 and Sub-Gravity Drainage Dist. 1 and 2, Calcasieu Parish. Robert J. Christ, secy.-treas., Lake Charles, La. D. W. Jessen, Kaufman Bldg., 809½ Ryan St., Lake Charles, La., engr. Bids Sept. 19.

BUILDINGS—LB & CA

▲ **City School Bd.**, Bank and Charlotte Sts., Norfolk, Va., rejected bids Aug. 23, Lakewood JUNIOR HIGH SCHOOL, NORFOLK, VA. LB **$1,988,473**. CD 9/3, under LB.

Mathis Constr. Co., Box 1106, Athens, Ga., LB **$472,388**, North Ga. Trade & Vocational School addns., CLARKSVILLE, GA. Div. Vocational Educ., State Dpt. Educ., Capitol Square, Atlanta, Ga. Albany Architects & Engineers, Box 1778, Albany, Ga., archts-engrs. Bids Sept. 26. CD 10/3/46.

Caldwell-Scott Eng. & Constr. Co., Inc., 340 S.E. 24 St., Fort Lauderdale, Fla., LB **$266,681**, Item No. 1, block walls; LB **$274,081**, Item 2, concrete walls WAREHOUSE and appurtenances, Pier 4, Port Everglades, FORT LAUDERDALE, FLA. Broward Co. Port Auth., Port Everglades Station, Fort Lauderdale, Fla. Bids Sept. 27. CD 9/16.

▲ **A. C. Samford, Inc.**, Box 1229, Albany, Ga., CA **$1,148,500**, 120-unit HOUSING, N.W. 10 St. and 2 Ave., N.W. 18 St. and 6 Ave., POMPANO BEACH, FLA. Housing Auth. of Pompano Beach, Hammondville Rd., Pompano Beach, Fla. Bids Aug. 29, awarded Sept. 30. CD 9/5, under LB.

David B. Miller & Co., Box 425, Lake Charles, La., LB **$460,543** (3 bidders), South Cameron HIGH

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12 "J" BOLT STUDS are used as hooks for materials handling, as rope hooks, etc.

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NELWELD

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SCHOOL restoration, CAMERON, LA. Parish School Bd., U. E. Hackett, supt., Cameron, La. Robert L. Miller, 720½ Ryan St., Lake Charles, La., archt.

Horace B. Rickey, Inc., P.O. Box 520, Lafayette, La., CA **$500,000**, MEDICAL and SURGICAL BLDG. group in Heymann Oil Center, LAFAYETTE, LA. Heymann Oil Center, Maurice Heymann, Lafayette, La.

▲ **Haas & Haynie**, 275 Pine St., San Francisco 4, Calif. and **R. P. Darnsworth & Co.**, 1515 S. Salcedo St., Box 850, New Orleans, La., CA Total est. **$31,000,000**, PAPER PLANT, ST. FRANCISVILLE, LA. St. Francisville Paper Co. (Crown Zellerbach Corp. & Time, Inc.), St. Francisville, La. CD 9/17.

J. D. Jennings Corp., 311-E. Barber St., Louisville, Ky., CA **$797,332**, STUDENT UNION BLDG., LOUISVILLE, KY. University of Louisville, 3 and Shipp Sts., Louisville, Ky. Bids Sept. 26. CD 10/1, under LB.

MIDDLE WEST

HEAVY CONSTRUCTION—BA

Wis., **Madison**—STADIUM—BA 10/24—University of Wisconsin, Madison, 10,000 addnl. seats in stadium. Plans deposit $25. Mead & Hunt, Inc., 2320 University Ave., engr.-archt.

O., **Bedford Heights**—BA 10/25—Village, Aurora Rd., sewage disposal plant, $635,000. Willard Schade & Assoc., Chester-12th Bldg., Cleveland, Zone 14, engrs. CD 11/11/55.

▲ Ind., **Indianapolis**—BA 10/29—Bd. Sanitary Comrs., 421 N. Pennsylvania St., Contract 57-SS3-A-HS, Part 1 and Part 2, West 14 St. and Kessler Blvd. storm relief sewers, Section A. Plans deposit R100. Henry B. Steeg & Assocs. Inc., 3338 N. Illinois St., Zone 8, engr. CD 3/3/51.

Wis., **West Allis**—BA 11/18—City, City Hall, 4 m.g. underground rein.-con. reservoir, pump houses, pumps, etc. $700,000. Plans deposit $25. Consoer, Townsend & Assoc., 360 E. Grand St., Chicago, Ill., engrs. Peter H. Burbach, city engr.

BUILDINGS—BA

Ill., **Dixon**—STORAGE—BA 10/22—State Div. Architecture & Eng., Armory-Office Bldg., Springfield, storage bldg., Dixon State School.

Ill., **East Moline**—STORAGE, etc.—BA 10/22—State Div. Architecture & Eng., Armory-Office Bldg., Springfield, complete work for storage bldg. for farm; sewer from Grease Basin, C Building, East Moline State Hospital.

† Mich., **Jones**—GARAGE—BA 10/24—State, A. N. Langius, dir. State Bldg., Lewis Cass Bldg., Lansing, 1 story, 60x120 ft., 2 bldgs. masonry, steel frame, maintenance garage for State Hy. Dpt. Louis C. Kingscott & Assocs., 511 Monroe, Kalamazoo, archts.

▲ O., **Columbus**—COLLEGE BLDG.—BA 10/30—Dpt. P. Wks., State Dpts. Bldg., chemical engineer bldg., for College of Eng., Ohio State University. $1,500,000-$2,000,000. Plans deposit $25. Small, Smith, Reeb & Draz, 1010 Euclid Ave., Cleveland, Zone 15, archts. CD 4/18/56.

HEAVY CONSTRUCTION—SLC

Mich., **Romulus**—Charfoos & Topper, 18304 James Couzens Hy., Detroit, Zone 35, soon lets contract 10,902 lin. ft. 12 in. vitr. clay sanitary sewers, Cogswell Rd. south of Northline Rd. Claude Postiff Co., 13745 West 8 Mile Rd., Detroit, Zone 35, engr.

BUILDINGS—SLC

▲ Ill., **Chicago** — RESEARCH LABORATORY — Michael Reese Hospital, 29 St. and Ellis Ave., soon lets contract 6 story, brick, steel, concrete Ruth Cummings Research Laboratory, 2912-18 S. Ellis Ave. $1,200,000. Loebl, Schlossman & Bennett, 430 N. Michigan Ave., archts. CD 10/26/56.

Mich., **Ypsilanti**—EDUCATIONAL—First Methodist Parish, Carroll Caldwell, pres. Bd. Trustees, Ypsilanti, soon lets contract 2 story, 30,000 sq. ft., masonry, steel Educational Bldg. R. S. Gerganoff, 206 North Washington, archts. CD 2/7.

HEAVY CONSTRUCTION—LB & CA

▲ **OHIO**—State Dpt. Hys., Columbus, Zone 15,

Visintine & Co., 1315 Egehill Rd., Columbus, O., LB **$1,440,000**, est. $1,645,200. second section of Goodale line of Columbus expressway incl. 4 bridges from Dennison Ave. east of 3 and 4 Sts., Columbus, Franklin Co. Bids Oct. 1. CD 9/11.

ILLINOIS—Dpt. P. Wks. & Bldgs., Div. Hys., Centennial Bldg., Springfield,

Gunther Constr. Co., 600 E. Main St., Galesburg, Ill., CA **$676,364**, wid'n. 7.19 mi. and c. conc. base course 1.67 mi. Ill. Rte. 41, Galesburg to Abingdon, Knox Co. Bids Sept. 17. CD 9/23, under LB.

St. Clair Co., c/o Devereux Murphy, co. hy. supt., Belleville, Ill., Own Forces, **$200,000**, repairs to various county roads and bridges caused by storms and floods past summer, BELLEVILLE, ILL. CD 7/10.

▲ **Healy Bros. & Co.**, 9504 W. 47 St., Brookfield, Ill., CA **$1,580,570**, Howard St Intercepting Sewer, Contr. No. 5, Niles, CHICAGO, ILL. Metropolitan Sanitary Dist. of Greater Chicago, 100 E. Erie St., Chicago, Ill. CD 9/3, under LB.

Robert R. Anderson Co., 4550 W. Patterson St., Chicago, Ill., LB **$917,108**, 9 span, 506 ft. steel concrete Van Buren St. bridge over NW Superhighway, CHICAGO, ILL. City, City Hall, Chicago, Ill. CD 9/5.

Robert L. O'Neil Bldrs. Inc., & James Costello, 6406 N. Oakley Blvd., Chicago, Ill., LB **$331,390**, sewage treatment plant addn., wells and well house, HINSDALE, ILL. Hinsdale Sanitary Dist., 101 S. Washington St., Hinsdale, Ill.. Alvord Burdick & Howson, 20 N. Wacker Dr., Chicago, Ill., engrs.

George E. Scheflow Co., 253 W. North St., Elgin, Ill., CA **$210,816**, sewage treatment plant addn. and sanitary sewer addn., MARENGO, ILL. City, City Hall, Marengo, Ill., CD 8/29, under LB.

MICHIGAN—State Hy. Comn., Stevens T. Mason Bldg., Lansing,

Smith Bros. Excavating Co., Cassopolis, Mich., CA **$244,093**, est. $290,000. base course, prime and double seal 4.26 mi. parts of M-115 and M-55, F 83052, C1-R (F 372 11) F 83052 C2-U (F372 11) F83052 C3-U (F372 (11) F 83021 C2-U (F 96 12) F 83021 C1-R (F96-12) Mackinac Co. Bids Aug. 21. CD 7/31.

Dykehouse Brothers, 445 N. Ferry St., Grand Haven, Mich., CA **$152,500**. sanitary sewer Spartan Village to provide facilities for three sections, Michigan State University, EAST LANSING, MICH. State, State University Govt. Bd., East Lansing, Mich. CD 12/2/53;

The Farrington Co., 3241 W. St. Joseph St., Lansing, Mich., CA **$74,910 (A)**, water mains and CA **$74,736 (B)** steam mains to intramural bldg., Spartan Village (East Lansing, Mich.)

Pittsburgh-Des Moines Steel Co., 679 First Natl. Bank Bldg., Chicago 3, Ill., LB **$111,155**. 500,000 gal., 168 ft. high elevated steel water tank Dupont St. near Coldwater Rd., FLINT, MICH. Beecher Metropolitan Dist., Stanley A. Ears, secy., G-1049 Louis Ave., Flint 5, Mich. Bids Aug. 30. CD 8/9.

BUILDINGS—LB & CA

Knowlton Constr. Co., 1133 W Columbus St., Bellefontaine, O., LB **$696,700** general contract 3 story 72 x 120 ft. college of education bldg., ATHENS, O. Ohio University, Athens, O. Bids Oct. 1. CD 9/5.

▲ **Jos. J. Stoller, Inc.**, 6800 Hayes St., Cincinnati, O., Own Forces, **$1,650,000**, ninety 1 and 1½ story brick, HOME, off Anderson Ferry Rd., CINCINNATI, O. Thos. Graham Assoc., 1715 Madison, Mt. Healthy, O., engrs.

▲ **Leviton Constr. Co.**, Keith Bldg., Dayton, O., CA Est. **$1,500,000**, NORTH PLAZA SHOPPING CENTER, 15 store, 120,000 sq. ft., 1000 car parking lot, adjoining Liberal unit at traffic circle between U.S. 25 and old Dixie Highway, DAYTON, O. Liberal Markets, Inc., 230 Concord, Dayton, O.

Brown Constr. Co., 2530 Payne Ave., Cleveland, Zone 14, O., LB Est. **$610,000** (8 bidders) 16-room

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SCHOOL for St. Columbkill's Parish, PARMA, O. Catholic Diocese of Cleveland, 1027 Superior Ave., Cleveland 14, O. John Lipaj, The Arcade, Cleveland 14, O., archt. CD 7/24.

▲ **Huber Constr. Co., Inc.**, 3620 Roswell Dr., Reynoldsburg, O., Owner Builds, **$16,000,000**, 1,200 brick HOMES with attached garage, Rose Hill Heights Development, REYNOLDSBURG, O. Ralph L. Woolpert Co., Dayton, O., engr.

Knowlton Constr. Co., 1133 W. Columbus, Bellefontaine, O., LB **$618,700**, HIGH SCHOOL, WAPOKENTA, O. Bd. Educ., Waponkenta, O. Sullivan & Isaacs-Sullivan, Reading Rd., Reading, O., archts. CD 9/4/57.

Frank Cesare, 1617 75 Court, Elmwood Park, Ill., CA **$400,000**. Motor World West HOTEL, 5255 W. 47 St., FOREST VIEW, ILL. Owner, c/o Fred F. Kean & Assocs., 5300 S. Pulaski St., Chicago, Ill.

E. W. Sproul Constr. Co., 173 W. Madison St., Chicago, Ill., CA **$698,766** (a) new GRADE SCHOOL, Geneva and Bloomingdale Rds. (b) Ben Franklin GRADE SCHOOL addn., Bryant Ave. (c) JUNIOR HIGH SCHOOL addn., 240 Hawthorne Blvd., GLEN ELLYN, ILL. School Dist. 41, Village Hall, Glen Ellyn, Ill. Bids Sept. 16. CD 9/25, under LB.

▲ **C. Vedra Constr. Co.**, 1840 Kenilworth, Berwyn, Ill., LB **$1,495,430** (a) ADMINISTRATION AND ACADEMIC BLDG. (b) VOCATIONAL AND TECHNICAL BLDG., addn. to present high school, Broadway, 151st and Main Sts., HARVEY, ILL. Thornton Twp. School Dist. 205, 151st and Broadway, Harvey, Ill. Joseph C. Llewellyn Co., 38 S. Dearborn St., Chicago, Ill., archt. Bids Sept. 26. CD 9/6.

Dakota Corp., 5225 W. Burleigh St., Milwaukee, Wis., Owner Builds, **$370,000**. 33 RESIDENCES, MILWAUKEE, WIS.

Jeffress-Dyer Corp., 545 S. Main St., Ann Arbor, Mich., CA Est. **$500,000**. RESEARCH and DEVELOPMENT HEADQUARTERS, incl. laboratory, ANN ARBOR, MICH. Bendix Aviation Corp., 1104 Fisher Bldg., Detroit, Mich. Giffels & Vallet, Inc., 1000 Marquette Bldg., Detroit, Mich., archt. CD 9/28.

▲† **Kay-Cee Constr. Co.**, 2647 W. Lawrence Ave., Chicago, Ill., CA **$1,897,000** (3 bidders) new HOSPITAL facilities, Fort Custer, BATTLE CREEK, MICH. Veterans Admin., Munitions Bldg., Wash., D. C. Bids Sept. 17. CD 9/19.

WEST OF MISSISSIPPI

HEAVY CONSTRUCTION—BA

▲ **Mo., St. Louis**—BA 11/5—City, Frank Kriz,, acting pres. Bd. P. Service, 304 City Hall, 12 Blvd. and Market St., Zone 3, clear water basin adjacent to new distr. pumping station at Chain of Rocks Waterworks Plant on Mississippi River, St. Louis Water Div. $1,600,000. CD 4/25.

BUILDINGS—BA

▲ **Colo., Lakewood**—SHOPPING CENTER—BA 11/5—Stores Realty Co., 6067 Wilshire Blvd., Los Angeles, Calif., shopping center (first phase) incl. 2 story, part bsmnt. 122,000 sq. ft. May Co. store; four 1 story shops, 4,135 car blacktopped paving parking area. $5,000,000. Raymond H. Ervin & Assoc., 1500 Denver Club Bldg., Denver, Colo., and Welton Becket & Assocs., 5657 Wilshire Blvd., Los Angeles, Calif., archts. CD 2/14, under May Department Store Co. as owner.

† **N. M., Moriarty**—HOUSING UNITS—BA 11/15—Base Procurement Office, Richards-Gebaur Air Force Base, Grandview, Mo., construction, landscaping, etc. 27 family housing units. Plans deposit $50.

† **N. M., Tierra Amarilla**—HOUSING UNITS—BA 11/15—Base Procurement Office, Richards-Gebaur Air Force Base, Grandview, Mo., construction, landscaping, etc. 27 family housing units. Plans deposit $50.

† **Tex., Zapata**—FAMILY HOUSING, etc.—BA 11/15—Base Procurement Office, Richards-Gebaur Air Force Base, Grandview, Mo., constr. family housing units, landscaping, etc. Plans deposit $50.

Tex., Fort Worth—MEDICAL ARTS—BA 11/19—Jesse H. Jones Interests, c/o Clay Berry, mgr., c/o Fair Bldg., modernize and air-condition existing 18 story medical arts bldg. $600,000. Palmros Eng. Co., c/o Oil & Gas Bldg., engr. CD 10/4.

HEAVY CONSTRUCTION—LB & CA

▲ **MISSOURI**—State Hy. Dpt., Jefferson City, bids opened 9/26,

Mo.—**Stupp Bros. Bridge & Iron Co.**, 3800 Weber Rd., St. Louis, Mo., LB **$2,354,986** (4 bidders), steel truss spans Missouri River superstructure; LB **$1,687,678** (4 bidders), plate girder spans Missouri River approach superstructure, Boone and Cooper Counties;

Mo.—**J. A. Tobin Constr. Co.**, 3701 Rainbow Blvd., Kansas City, Kan., LB **$293,969** (10 bidders), 6-51 ft. const. I-Beam Spans, (twins) Sta. 600 plus 15 (dual), Buchanan Co.;

Mo.—**George Bennett Constr. Co.**, 3001 N. 7 Trafficway, Kansas City, Kan., LB **$116,488** (10 bidders) 3-50 ft. rein.-con. deck girder spans, Sta. 592 plus 64, Buchanan Co.;

Mo.—**Maxwell Bridge Co., Inc.**, Columbus, Kan., LB **$626,389** (9 bidders), Missouri River approach substructure, Boone and Cooper Counties.

▲ **OKLAHOMA**—State Hy. Dpt., Capitol, Oklahoma City, Zone 5,

Okla.—**Pool Constr. Co.**, Box 540, Shawnee, Okla., CA **$88,627**. est. $88,632, b. conc. surf. 4.259 mi. U. S. 77 west of Kildare, Kay Co.; CA **$86,228**,

(Continued on page 364)

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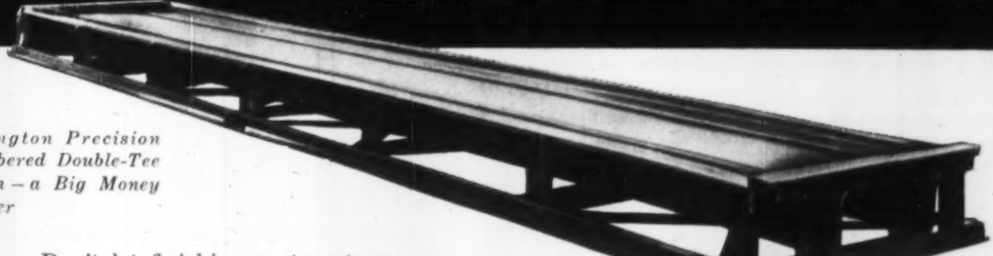

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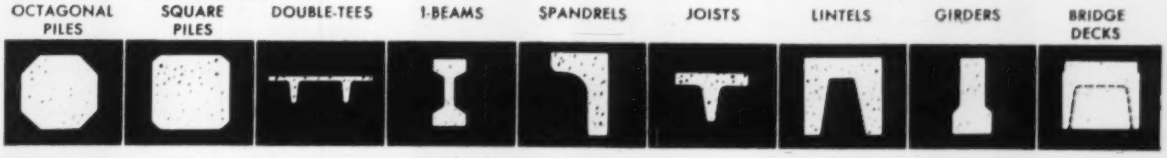

(Continued from page 362)

est. $95,018, grading, drainage 5.513 mi. Hy. 84 north of Dustin, Okfuskee Co.; CA **$218,450**, est. $218,546, stab. aggreg. base and bit. surf. 7.867 mi. on Hy. 31 in Bokoshe, Leflore Co.; CA **$85,171**, est. $94,309, grading, draining 3.896 mi. on Hy. 84 between Dustin and Weleetka, Okfuskee Co.;

Okla.—**Standard Industries**, 2109 E. 11 St., Tulsa, Okla., CA **$223,616**, est. $278,538, c. conc. 2.891 mi. U. S. 62 east of Paden, Okfuskee Co.; CA **$521,-278**, est. $634,452, c. conc. 5.824 mi. U. S. 62 through Paden, Okfuskee Co.;

Okla.—**Anchor Constr. Co.**, 811 Midstates Bldg., Tulsa, Okla., CA **$424,709**, est. $532,058, stab. aggreg. base and b. conc. 6.784 mi. Hy. 75 through Glenpool, Tulsa Co.;

Okla.—**Curry Material Co.**, Antlers, Okla., CA **$363,801**, est. $364,267, stab. aggreg. base and rock asph. surf. 6.591 mi. Hy. 21 in Broken Bow, McCurtain Co.;

Okla.—**Admiral Paving Co.**, 5501 E. Admiral St., Tulsa, Okla., CA **$221,938**, est. $222,301, c. conc. 0.996 mi. Hy. 20 through Hominy, Osage Co.;

Okla.—**H. D. Youngman**, Baxter Springs, Kan., CA **$116,177**, est. $126,889, c. conc. 0.963 mi. Hy. 16, Beggs, Okmulgee Co.;

Okla.—**Merritt—McKnight Co.**, Box 134, McAlester, Okla., CA **$163,161**, est. $163,143, stab. aggreg. shoulders 7.348 mi. U. S. 70 west of Durant, Bryan Co.;

Okla.—**Clarence Keck**, Fairview, Okla., CA **$88,410**, est. $109,482, grading, draining 7.156 mi. Hy. 30 north of Reydon, Roger Mills Co.;

Okla.—**Smith Bros.**, Noble, Okla., CA **$161,429**, est. $257,057, grading, draining 6.566 mi. 4-lane road on U. S. 66 west of Elk City, Beckham Co.;

Okla.—**Haskin Constr. Co.**, Cordell, Okla., CA **$117,-879**, est. $145,770, grading, draining 4.373 mi. 4-lane road on U. S. 66 through Canute, Washita Co.;

Okla.—**W. D. Jeffrey Co.**, 4201 Towson St., Fort Smith, Ark., CA **$173,210**, est. $194,997, grading, draining 4.638 mi. Hy. 82 south of Locust Grove, Mayes Co.;

Okla.—**John Erts**, 2201 Classen St., Oklahoma City 6, Okla., CA **$95,435**, est. $104,498, blended rock asph. surf. Hy. 69 north of McAlester, Pittsburgh Co. CD 9/19;

Okla.—**Curtis Corp.**, Tri-State Bldg., Tulsa, Okla., CA **$285,373**, est. $293,072 c. conc. 1.207 mi. Hy. 51 through Wagoner, Wagoner Co. Grand total, $3,-435,391. Bids Oct. 1. CD 9/23.

COLORADO—State Hy. Dpt., 4201 E. Arkansas St., Denver,

Colorado Constructors, Inc., 725 W. 39 Ave., Denver, Colo., CA **$918,117**, plant mix asph. surf. 6.989 mi. DeBeque and Palisade, Colo. Proj. F 0001-1 (15), Mesa Co. Bids Oct. 1. CD 9/19.

BUILDINGS—LB & CA

H. L. Stavn Co., Hibbing, Minn., LB **$524,800** (7 bidders) general contract ELEMENTARY SCHOOL at Hoyt Lakes, AURORA, MINN. Bd. Educ., Independent School Dist. No. 13, N. M. Brown, clk., Aurora, Minn. Bids Sept. 26. CD 9/11, under Min., Hoyt Lakes.

Adolfson & Peterson, 2817 Bryant Ave. South, Minneapolis, Minn., LB **$613,900** (12 bidders) SCHOOL, WAYZATA, MINN. Bd. Educ., J. J. Kardong, clk., Wayzata, Minn. Bids Oct. 1. CD 9/20.

▲ **Weitz Co.**, 406 Fleming Bldg., Des Moines, Iowa, CA **$2,335,539**, general contract Y.M.C.A. BUILDING, DES MOINES, IOWA. Young Men's Christian Assn., 4 and Keo Way, Des Moines, Iowa. Bids June 5. CD 6/21, under LB.

▲ **Swenson Constr. Co.**, 3305 Terrace St., Kansas City, Mo., CA Total est. **$3,500,000.** general contract 2 story, 133,700 sq. ft., central OPERATING HEADQUARTERS, Front St. and Manchester Trafficway, and serving and repairing garage, KANSAS CITY, MO. Kansas City Power & Light Co., 14 and Baltimore St., Kansas City, Mo. Burns & McDonnell Eng. Co., 95 and Troost Sts., Kansas City, Mo., engr. CD 1/13/56;

Elus Corp., 7535 Myrtle St., Kansas City, Mo., CA mechanical work for operating headquarters (Kansas City, Mo.);

Evans Electric Constr. Co., 1621 Locust St., Kansas City, Mo., CA electrical work for operating headquarters (Kansas City, Mo.);

Walton Viking Co., 501 Sunshine Rd., Kansas City, Mo., CA sprinkler system for operating headquarters (Kansas City, Mo.).

Dutoit Constr. Co., 4908 Lister St., Kansas City 30, Mo., LB **$588,501**, est. $860,000 (7 bidders) general contract 4 story, 45x207 ft., rein.-con. frame WOMEN'S DORMITORY and 4 story 50x97 ft. MEN'S DORMITORY, WARRENSBURG, MO. Central Missouri State College, Bd. Regents, Jamce C. Kirkpatrick, chn., Warrensberg, Mo. Bids Sept. 26. CD 9/10.

L. L. McCandless Constr. Co., 1215 S. Congress St., Austin, Tex. Owner Builds. **$725,000** MOTOR HOTEL, **$350,000** RESTAURANT-CLUB, Corner Interregional Hy. between E. 23½ and 24 Sts., AUSTIN, TEX. CD 10/1.

Maxwell Constr. Co., Box 504, Baytown, Tex., CA **$702,303** Anthony Lucas Elementary SCHOOL, BEAUMONT, TEX. Beaumont Independent School Dist., Beaumont, Tex. Bids Sept. 6. CD 9/26, under LB.

J. M. Odom, Box 774, Austin, Tex., LB **$929,737** CHEMISTRY BLDG., COLLEGE STATION, TEX. A&M College of Texas c/o System Admin. Bldg., College Station, Tex. Bids Sept. 20. CD 8/30.

J. M. Odom, Box 774, Austin, Tex., LB **$482,003.** WAREHOUSE and SHOP, COLLEGE STATION, TEX. A&M College of Texas, c/o System Administration Bldg., College Station, Tex. Bids Sept. 20. CD 8/30.

▲ **Tellepsen Constr. Co.**, Box 2536, Houston, Tex., LB **$1,154,500** 3 story, bsmnt., SURGICAL HOSPITAL addn. HOUSTON, TEX. St. Elizabeth's Hospital, 4515 Lyons Ave., (administered by Missionary Sisters of the Order of Immaculate Conception) Houston, Tex. Bids Sept. 26. CD 9/12.

▲ **Fluor Corp.**, 589 5th Ave., New York, N. Y., CA **$1,500,000**, 2,100 b/d ALKYLATION UNIT in refinery, PORT ARTHUR, TEX. Atlantic Refining Co., General Office, Atreco, Port Arthur, Tex. CD 5/13.

▲ **Walsh & Burney Co.**, Box 5176, Beacon Hill Station, San Antonio, Tex., LB .**$1,349,900.** CHILDREN'S HOSPITAL and OUT-PATIENT CLINIC, SAN ANTONIO, TEX. Santa Rosa Childrens' Hospital Fdn., W. Houston and Santa Rosa Sts., San Antonio, Tex. Bids Sept. 26. CD 9/11.

Spaw-Glass, Inc., Box 6712, Houston 5, Tex., CA **$899,500** Base Bid (3 jobs) MEN'S DORMITORY, WOMEN'S DORMITORY, MARRIED STUDENTS HOUSEKEEPING, SAN MARCOS, TEX. Southwest Texas State Teachers College, San Marcos, Tex. Bids Sept. 23. CD 10/7, under LB.

▲ **The Wah Chang Corp.**, c/o Tom Mackey, Owners engr., Texas City, Tex., (233 Broadway, New York., hdqrs.) Purchase and Hire. **$1,975,000** extension of renovation work on old Texas City TIN SMELTER PLANT to produce tin, tin alloys and tungsten products. TEXAS CITY, TEX. CD 10/2.

▲ **Texas Rolling Mills, Inc.**, c/o R. I. Sample, 3806 Olympia St., Houston, Tex., Purchase and Hire. **$1,250,000** constr. PIPE MILL for Plant "A" TEXAS CITY, TEX. CD 10/2.

FAR WEST

HEAVY CONSTRUCTION—BA

† **Arizona-Utah**—BA 11/11—Bureau Reclamation, Dpt. Interior, Denver Federal Center, Denver Colo., 3,000,-000 bbl. cement to be used in constr. Glen Canyon Dam in next 6 years, Colorado River Storage Proj., Inv. No. DS 4952. Extended date. CD 8/9.

▲ **Calif., Los Angeles**—BA 11/1—Los Angeles Co. Flood Control Dist., 12250 Alcazar St., Proj. No. 6 East Compton Creek No. 2 Storm Drain, Unit 3, $5,000,000 CD 11/7/52.

BUILDINGS—BA

Wash., Yakima—LIBRARY—BA 10/22—Yakima Valley Regional Library Bd., 17 N. 1 St., 1 story, bsmnt., 100x180 ft. rein.-con. library. $720,000. J. S. Villesvik, 109 N. 3 St., archt.

† **Idaho, Cottonwood**—HOUSING—BA On Or About 11/26—Procurement Office, 84th Fighter Group (Air De-

(Continued on page 366)

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Michigan gravel firm BOOSTS PRODUCTION by opening shorter haul route

. . . L-W Rear-Dump licks sand, uphill haul

To step up production of sand and gravel needed for paving Michigan Route 27, Nashville Gravel Co., Nashville, Michigan, opened a more direct pit-to-plant route. The new half-mile haul-road was extremely sandy, with difficult adverse grades. It was considerably shorter, however, than the "long way around" which Nashville's LeTourneau-Westinghouse D Tournapull® Rear-Dump and 3 other haulers on the job had been using.

Hauling weighed loads of up to 15 tons, the 138 hp "D" demonstrated its rugged muscle-power and traction. It climbed a steep grade out of the pit with little difficulty, where competitive units had to wait until a bulldozer cut down the grade. Machine hauled steadily over the rough haul-road, without trouble. It made several trips — pioneering and compacting the trail so that Nashville's other units could risk using the new shorter route.

Produced 1500 tons tested gravel daily

To supply two double-drum pavers on Route 27, 1500 tons of tested gravel had to be produced per day from the pit. The Rear-Dump regularly hauled heaped loads 2115′ over sandy, hilly roads . . . deposited loads in hopper . . . then returned the same distance, averaging the 4230′ cycle in 7.61 minutes.

"Gets where other units won't go"

Supt. Dale Smith had this to say about the D 'Pull* Rear-Dump: "We like its maneuverability. It will get in and out of places where our other units won't go. It's safer, because the operator has good visibility and positive dumping control."

Owner F. G. Cheney said, "We like the Tournapull because it delivers more material on this longer haul. The flotation of the big tires is good in soft conditions."

It will pay you to investigate LeTourneau-Westinghouse Tournapull Rear-Dumps. They're top production haulers that work profitably everywhere, and especially in rugged terrain. Available in 3 sizes to fit your particular jobs: 11, 22, and 35-ton models. Write for full details.

D 'Pull Rear-Dump spills 15-ton load of sand and gravel into hopper at washing plant near Nashville, Mich. Here gravel is washed, processed, and tested for Michigan State specifications — to be used in manufacturing concrete to pave Route 27.

*Trademark DR-1299-Q-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

(Continued from page 364)

fense) U. S. Air Force Base, Geiger Field, Spokane, Wash., 27 housing units. Plans deposit $50. CD 9/19.

† **Ore., Burns**—HOUSING—BA On Or About 11/26—Procurement Office, 84th Fighter Group (Air Defense) U.S. Air Force, Geiger Field, Spokane, Wash., 25 housing units. Plans deposit $50. CD 9/25, under LB.

HEAVY CONSTRUCTION—LB & CA

Christensen **Excavating Co.**, 4550 S. 200 E. Murray Utah, LB **$421,656** sewer line Sect. II SALT LAKE CITY, UTAH. Granger-Hunter Imprvt. Dist. 3530 S. 2820 W. Salt Lake City, Utah. Bids Sept. 23. CD 9/6.

Enoch Smith & Sons, 1441 Beck St., Salt Lake City, Utah. LB **$385,043** sewer lines section III (Salt Lake City, Utah).

† **WASHINGTON**—Bureau P. Rds., Dpt. Commerce, Morgan Bldg., Portland, Ore.,

C. **M. Corkun**, 2630 S. W. 2 Ave., Portland, Ore., LB **$507,238**, 598 ft. steel deck truss bridge over Wine River near Carson, Proj. 30-C. Bids Oct. 4. CD 9/20.

† **Thompson Constr. Co. & George W. Lewis**, Kennewick, Wash., CA **$613,028**, constr. earthwork, concrete canal lining, and structures for Wahluke Branch canal, Sta. 171/13.4 AH to 333/20, Columbia Basin Proj., Spec. DC 4943, near Othello, WASHINGTON. Bureau Reclamation, Dpt. Interior, Ephrata, Wash. Awarded Sept. 27. CD 9/5, under LB.

▲ **Jerry Artukovich & N. A. Artukovich Constr. Co.**, 723 Union St., Montebello, Calif. (joint venture) CA **$2,790,183** storm drain, Bond Issue Proj. 12, Manhattan Beach Blvd. Storm Drain, Redondo Beach, El Segundo, Hawthorne, Los Angeles, LOS ANGELES, CALIF. Los Angeles Co. Flood Control Dist., 2250 Alcazar St., Los Angeles, Calif. Bids Aug 2, CD 8/8, under LB.

▲ **Morrison Knudsen Co., Inc & Macco Corp.**, 411 West 5 St., Los Angeles, Calif., LB **$12,089,596** (8 bidders) 3 schedules; welded steel pipe for constr. 14 mi. pipe line from Santa Ana Canyon to Los Angeles Co. East Boundary, LOS ANGELES, CALIF. Metropolitan Water Dist., 306 W. 3 St., Los Angeles, Calif. Bids Oct. 2.

▲ **Guy F. Atkinson Co.**, 10 West Orange Ave., South San Francisco, Calif., **Arundel Corp.**, Pier 2, Pratt St., Baltimore, Md. and **L. E. Dixon**, 409 S. California St., San Gabriell, Calif. LB **$8,136,420** (joint venture) (8 bidders) 29,200 ft. 12 in. diam. tunnel connecting Cherry Dam with Penstocks at Cherry Power House, 5,850 ft. 81 x 11 ft. tunnel to divert runoff from Lake Eleanor watershed into Cherry Reservoir Hetch Hetchy Dam, SAN FRANCISCO, CALIF. City and San Francisco Co., Pub. Utilities Comn., City Hall, San Francisco, Calif. Bids Oct. 3, CD 8/30.

construction by

TERRY

Reconstruction of Third Avenue Bridge for New York City's Dept. of Public Works, Frederick H. Zurmuhlen, Commissioner

One new truss replaces 2 existing interior trusses of the 300-ft.-long swing-span—while bridge is in open position. The concrete ramps and installation of machinery are also handled by Terry, specialists in difficult construction work in U. S. and abroad.

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TERRY | *Terry Contracting, Inc.*
Terry Steel Contractors, Inc.

The Terry Building, 31 East 27th St., New York 16, N. Y.

BUILDINGS—LB & CA

▲ **Alfred Brown Co.**, 224 Dooly Bldg., Salt Lake City, Utah, CA **$1,658,273** DORMITORY facilities for men and women, at University of Applied arts, LOGAN, UTAH. Utah State Bldg. Bd., J. G. King, Supt., 419 State Capitol Bldg., Salt Lake City, Utah. Bids Sept. 10, CD 9/13, under LB.

▲ **Tom E. Norcross**, 6053 Atlantic Ave., Long Beach, Calif., CA **$1,337,300** general work, 100,000 sq. ft. PHYSICAL EDUCATION BLDG. at Los Angeles State College of Applied Arts & Sciences, San Bernardino Freeway Campus, W. O. 3719 C-38, LOS ANGELES, CALIF. State Div. Architecture, 1100 S. Grand Ave., Los Angeles, Calif. Bids Sept. 24, awarded Oct. 2, CD 9/30, under LB.

▲ **Robert E. McKee**, 4701 San Fernando Rd., West, Los Angeles 39, Calif., LB **$2,773,300** (3 bidders) general work two 2 story, 225,000 sq. ft. floor area and 8 roofed shelter areas, WARD BLDGS. at Patton State Hospital, W. O. 3774, GC, 4007GC-50 PATTON, CALIF. State Div. Architecture, 1100 S. Grand Ave., Los Angeles, Calif. Bids Oct. 2. CD 9/3;
Allen Eng. Co., 4247 Eagle Rock Blvd., Los Angeles, Calif., LB **$398,888**, (7 bidders) electrical work, (Patton, Calif.);
E. O. Nay Co., Inc., 2014 East Colorado St., Pasadena 8, Calif., LB **$816,349** (5 bidders) mechanical work (Patton, Calif.)

Walter Hachman, 1020 W. Mariposa, Stockton, Calif., CA **$364,498** Elementary SCHOOL to replace Old Davis School, STOCKTON, CALIF. Davis Elementary School Dist. c/o Principal, Rte. 2, Box 903, Stockton, Calif. Bids Aug. 20. CD 8/1.

CANADA

HEAVY CONSTRUCTION—BA

▲ **Que., Montreal**—BA 10/23—City, City Hall, constr. 4th section of Decarie-Raimbault collector sewer between Decarie Blvd. and Stinson St. $1,000,000. Plans deposit $200. 8/2.

HEAVY CONSTRUCTION—LB & CA

ALBERTA—Alberta Govt., Parliament Bldgs., Edmonton, Alta.—**Standard Gravel & Surfacing** and **J. A. Moulson Constr. Ltd.**, 1714-41st S.E., Calgary, Alta., CA **$348,225**, grading and other work on Highway No. 2, Innisfail to east of Penhold Mile 68.57 to Mile 76.15;
Alta.—**George Ludwig Ltds.**, 2007-36th St. S.E., Calgary, Alta., CA **$281,495**, grading and other work on Highway No. 2, east of Penhold to south of Red Deer, Mile 76.16 to Mile 83.59, Awarded Sept. 25.

BRITISH COLUMBIA—B. C. Govt., Parliament Bldgs., Victoria,

Kenyon & Co. Ltd., Penticton, B. C., LB **$333,114** (10 bidders), Bridge Project No. 272, Taft, Nineteen-Mile and Summit Lake overhead crossings on Trans-Canada Hy., Taft, Nineteen-Mile and Summit Lake. Bids Sept. 17. CD 9/12.

BRITISH COLUMBIA—B. C. Govt., Parliament Bldgs., Victoria, Radium Constr. & Contr. Co., Ltd., Parson, B. C. LB **$622,896** (17 bidders) Proj. 901, reconstr. 4.22 mi. Okanagan Hy., Kaleden-Skaha section. Bids Sept. 6.

BRITISH COLUMBIA—B. C. Govt., Parliament Bldgs., Victoria, Raymond International Co., 1104 Hornby St., Vancouver, B. C., CA **$875,692**; Proj. 890, 4.94 mi. Trans-Canada Highway, Revelstoke-Greeley Section. CD 8/23, under LB.

▲ **Craig & Ralston Ltd.**, 1485 Davie St., Vancouver, B. C., LB **$1,097,356** (3 bidders) constr. woodstave pipe line with internal dia. of 8 ft. forms part of Ash River development hydro electric project 20 mi. from Port Alberni, BRITISH COLUMBIA. B. C. Power Comn., P.O. Box 500, Victoria, B. C. H. G. Acres & Co. Ltd., 837 W. Hastings St., Vancouver, B. C., engr.

▲ **E. G. M. Cape & Co., (1956)**, 4898 Western Ave., Montreal, Que., CA Est. **$1,000,000**, imprvs. Grain Elevator No. 3, Montreal Harbor, MONTREAL, QUE. National Harbors Bd., West Block, Parliament Bldgs., Ottawa, Ont. Bids Sept. 27.

▲ **Dpt. P. Wks., Hunter Bldg.**, Ottawa, Ont., rejected bid May 31, wharf repairs, RIVIERE Du LOUP, QUE. LB **$2,300,404**. Project cancelled. CD 6/6, under LB.

BUILDINGS—LB & CA

Burns & Dutton Concrete & Constr. Co., Ltd., 9004-125th Ave., Edmonton, Alta., LB **$436,000** (4 bidders) WORKSHOP for mechanical equipment, Baniff National Park, BANIFF, ALTA. Dpt. P. Wks., Hunter Bldg., Ottawa, Ont.

▲ **A. R. Grimwood Ltd.**, 1129 Kingsway, Vancouver, B. C., CA **$1,291,230**, 5 story, 125-bed rein.-con. HOSPITAL addn., BARABY, B. C., Burnaby General Hospital, Burnaby, B. C. Bids Sept. 25. CD 8/29, under LB.

Pigott Constr. Co., Ltd., 1250 Bay St., Toronto, Ont., CA Est. **$350,000** (5 bidders), 3 story, 82x162 ft., steel curtain wall constr. ADMINISTRATION BLDG., Centre and Wallace Sts., WELLAND, ONT. Atlas Steels Ltd., 417 Main St. E., Welland, Ont. Bids Sept. 26. CD 9/16.

▲ **Shelbourne Hotel Corp.**, c/o Stanley R. Shenkman, archt., 3777 Cote de Neiges Rd., Montreal, Que., CA Est. **$1,000,000**, 4 story, bsmnt., 57x163 ft., concrete slab, steel and masonry, 100 room MOTOR HOTEL, Decarie Blvd. and Plamdonden Ave., MONTREAL, QUE.

(Continued on page 368)

Grader speeds from 0.41 to 26.0 mph

cut Indiana contractor's costs

Spears-Dehner's "660" slopes banks at 2.3 mph. Where rock was encountered, creeper speeds slow as 36′ per minute gave controlled power, without reducing depth of cut.

When you figure a grading job, you usually think in terms of grader operation at 2 or 3 — maybe 4 — miles an hour. True, this is the normal work-range. But now consider how added *high-range speeds* cut non-productive time... how wider range of *"just-right"* blading speeds boost grader output... how *extra-slow speeds* can actually hurry completion of jobs.

Here's how a modern 15-speed grader increases productivity:

Spears-Dehner highway job

Indiana Highway Department awarded Spears-Dehner, Inc., Ft. Wayne, Indiana, the contract for roadwork on 6.7 miles of State Route 427, between Hamilton, Ind. and the Ohio state line. This improvement-relocation job involved moving 200,000 cu. yds. of dirt and rock for highway fill.

Heavy equipment used by contractor included a 15-speed Adams* 660 grader, a crawler-scraper and 4 self-propelled scrapers, a push-tractor, dozer, and a flat roller. Photos of "660" were taken when contractor was building-up a 10′ fill with dirt hauled from a 10′ cut, down the road.

High-range speeds save time

The first opportunity for 150 hp Adams 660 to cut costs came as it was moved to the job site. An operator hopped on the Adams in Ft. Wayne ... rolled along streets and highways at 26.0 mph... made 45 miles in 1¾ hours. "660" arrived in plenty of time for a full 8 hours of productive work.

On the job, Adams' higher forward speeds also reduced waste-time, as grader hustled from one assignment to the next... from dirt loading zone to fill, etc. When doing one-way work, grader's *extra-fast reverse* also saved time. The Adams backed-up at 13.7 mph... made 5 blading "passes" in the time most other graders take for 4.

"Just-right" blading speeds

"660" also saved Spears-Dehner money with its 4 speeds in the normal work-range (instead of the customary 3). This permitted operator to work at engine speeds close to full rated rpm ... to push more dirt... to push it faster. Maintaining fill, as pictured below, Adams spread 4000 yards a day. Operator Otis Osborn used 3rd gear... bladed at 4.7 mph. With the same blade-load, other graders would work in 2nd gear... at 3.6 to 4.0 mph.

On heavy dirt work, such as ditching, "660" worked in second gear (3.2 mph), producing 1800′ to 5000′ more blade-work per hour than ordinary graders. And for bank sloping, operator used 1st gear, 2.3 mph.

Low-low creeper speeds

Contractor's "660" has creeper gears for full power, slow motion operation at 36′ to 160′ per minute. With these, the operator worked slowly for accurate cuts — but with tremendous power. He graded safely in rocky soil... around obstructions ... bladed precisely between forms. One hefty Adams cut saved several shallower half-throttle "passes". Creepers also minimize shock... eliminate need for "slipping the clutch"... reduce maintenance and downtime.

Help yourself to better profits

Ask for a demonstration. See how the multiple speed-power combinations, standard on all Adams graders, help you do more work at lower cost. Call or write for complete, free information. *Six models*, 190, 150, 123, 104, 80, 60 hp. GM or Cummins engines optional on 5 larger models.

*Trademark AG-1255-H-b-6

Grading fill for 10′ raise, 150 hp Adams 660 spreads 4000 cu. yds. per day at 4.7 mph, for Spears-Dehner, Inc.

LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

(Continued from page 366)

J. P. Cartier Ltd., 1819 Glendale St., Montreal, Que., LB **$500,000** (12 bidders) 20x260x400 ft. brick, block walls BUS GARAGE, concrete fdn., St. Denis and De Fleurimont Sts., MONTREAL, QUE. Montreal Transportation Comn., 159 Craig St. W., Montreal, Que. CD 9/19.

Piggott Constr. Ltd., 502-5th Ave. N., Saskatoon, Sask., CA **$495,300**, rein.-con. WAREHOUSE SASKATOON, SASK. T. Eaton Co. Ltd., Quebec and 38th Sts., Saskatoon, Sask. Moody & Moore, 295 Broadway, Winnipeg, Man., archts. Awarded Sept. 24.

PROPOSED PROJECTS

WATER SUPPLY

Conn., Niantic—Town of East Lyme Water Comn., Town Hall, Niantic, extend water system. **$945,000.** Clarence Blair Assocs., 100 Crown St., New Haven, consult. engrs.

▲ **O., Findlay**—City, Wm. Carlin, mayor. WW expansion, pipe line from reservoir to WW etc. **$1,000,000.**

O., Sheffield—Village, Village Hall, municipal water system. **$591,040.** Morris E. Nall & Assoc., Prospect 4th-Bldg., Cleveland, Zone 15, consult. engrs. CD 8/2.

SEWERS, WASTE DISPOSAL

▲ **Calif., Livermore**—City, City Hall, voted bonds Sept. 24, 2.5 M.G.D. secondary sewage treatment plant. **$1,300,000.** CD 8/2.

Kan., Lawrence—City, Harold Horn, mgr., City Hall, voted $705,000 bonds Sept. 10, sewerage sys. extens. imprvs., incl. transmission sewer from treatment plant to northwestern part of city, **$455,000**; relief sewer in 4th and Iowa Sts., **$90,000**; distr. sewer exten., **$160,000.** Black & Veatch, 1500 Meadow Lake Parkway, Kansas City 14, Mo., consult. engrs. CD 8/28.

▲ **Kan., Wichita**—City, Robert H. Hess, dir. Water Supply & Sewage Treatment, City Hall, sewage plant expansion south of here on Arkansas River. **$6,985,000.** Black & Veatch, 1500 Meadow Lake Parkway, Kansas City 14, Mo., consult. engrs. CD 4/18.

▲ **Mich., Detroit**—City, Glenn C. Richards, comr. P. Wks., City-County Bldg., voted $30,000,000 bonds Sept. 10, storm sewerage program to relieve flooded basements, 1957-58 Projects, incl. Livernois-Joy-Puritan, **$4,230,000**; Seven-Mile Rd. Proj., **$8,120,000**; Ford Expressway-Rivard-Cadieux Sewer, **$130,000**; Internal Relief Sewers, **$2,100,000.** M. F. Wagnitz, city engr. CD 7/3/56.

▲ **Mo., Independence**—City, City Hall, imprv. sewerage system. **$1,653,500.**

▲ **O., Massillon**—Comrs. Stark Co., Courthouse, Canton, sewerage system, sewage disposal plant, extend 5 sewage lines, build new line, enlarge present plant. **$2,422,000.** Floyd G. Browne & Assocs., 125 W. Churst St., Marion, consult. engrs.

STREETS AND ROADS

▲ **Calif., Redwood City**—San Mateo Co., c/o County Mgr., Courthouse, Highway Proj. **$1,500,000.**

▲ **Wash., D. C.**,—D. C. Govt., Highway Dpt., 499 Pa. Ave. N. W., constr. semi-depressed highway, 12th St. between Independence and Constitution Aves. N.W. **$3,400,000.**

▲ **Mo., St. Louis County**—St. Louis County, William H. Guhman, Co. P. Wks. Dir., Court House, Clayton, Zone 5, imprv. Kennerly Ave. from Lucas and Hunt Rd. to St. Louis City limits, **$394,740**; imprv. Ogden Ave. in Wellston-Pine Lawn area and from Wells to Kennerly Aves., **$215,000**; imprv. Airport Rd. from eastern city limits of Berkeley to Florrissant Rd., (excluding Wabash R.R. grade separation) and Hereford Ave. from Florissant Rd. to Elizabeth Ave. **$571,800.** CD 11/29/55.

Tex., Richland Hills—City, c/o Virginia Howard, secy., bonds defeated Sept. 17, street imprvs. and drainage. **$775,000.** Freese & Nichols, 407 Danciger Bldg., Fort Worth, consult. engrs.

▲ **ONTARIO**—Dpt. Hys., Parliament Bldgs., Toronto, **Port Credit**—widening to 4-lanes ½ mi. stretch No. 2 Hy. at west end of the village and constr. 4-lane bridge over Credit River. **$1,000,000.** CD 12/8/50.

EARTHWORK, WATERWAYS

▲ **Conn., Bristol**—State P. Wks. Dpt., 165 Capitol Ave., Hartford, flood control facilities, storage reservoirs, deepening, widening and straightening water courses of Pequabuck River. **$2,545,000.** Goodkind & O'Dea, 1214 Dixwell Ave., Hamden, consult. engrs. CD 9/18.

▲† **Ohio and West Virginia**—U. S. Eng., 925 New Federal Bldg., Pittsburgh 19, Pa., plans by A. M. Kinney Inc., consult. engr.-archt., 2905 Vernon Pl., Cincinnati, 19, O., dam, abutment, Lock emergency dam, appurtenances, New Cumberland Locks and Dam, Ohio River, **$4,500,000** appropriated. CD 9/5.

Tex., Pyote—Water Control & Imprvt. Dist. 4, voted bonds, water wells and accessories, **$500,000**; ground pipe system for sprinkling, **$100,000**; canal system, **$250,000**; irrigation gate system and misc. constr., **$110,000.** CD 9/9.

AIRPORTS

▲† **Oklahoma**—AIR NATIONAL GUARD BLDG.— Oklahoma National Guard, Will Rogers Field, Oklahoma City, plans by Nolen & Moore, Oklahoma Natural Gas Bldg., Oklahoma City, Air National Guard Bldg., incl. hangar, shops, headquarters, warehouse communications and utilities. **$3,000,000.**

LATIN AMERICA

▲ **Mexico, Vera Cruz**—PLANT—Industrieas Quimicas Basicas of Mexico, Mexico City, Mexico and Glidden Co. of U.S.A., 11001 Madison Ave., Cleveland 2, O., U.S.A. plans titanium bioxide pigment mfg. plant, **$6,400,000.** CD 8/7.

PUBLIC BUILDINGS

▲† **Ala., Auburn**—INSTITUTE—State of Alabama, Montgomery, **$4,500,000** bond election Dec. 22, buildings at Alabama Polytechnic Institute. CD 4/15/55.

▲ **Ala., Birmingham**—MEDICAL CENTER—State of Alabama, Montgomery, **$4,500,000** bond election Dec. 22 for budgs. at University of Alabama Medical College. CD 8/3/55.

▲ **Ala., Talladega**—SCHOOL—State of Alabama, Montgomery, **$3,000,000** bond election Dec. 22 for Alabama School for Deaf.

Conn., Middletown—COUNTY—Comrs. Middlesex Co., County Bldg., 225 Main St., plans by J. Francis Lamb, 252 Main St., county bldg., DeKoven Dr. **$550,000.** Jerome F. Mueller, 15 Lewis St., Hartford and Carl Gesund, 495 Orchard St., New Haven, consult. engrs. CD 9/5, under LB.

Conn., New Haven—PHYSICAL EDUCATION—State P. Wks. Dpt. plans by Lester J. A. Julianelle, 241 Orange St., physical education bldg., State Teachers College, Crescent St.; swimming pool, lockers, etc. **$750,000.** CD 2/5.

▲ **Conn., Putnam**—HOUSING—Putnam Housing Auth., City Hall, plans by Arthur E. Thomas, 28 Shetucket St., Norwich, 124 units low rent housing Farrows St. **$1,741,176.** Fred S. Dubin Assocs., 178 S. Whitney St., Hartford, consult. engrs. CD 5/22.

Conn., Stafford—SCHOOL—Town, Stafford, 16 room Junior High School. **$640,000.**

▲ **Del., Dover**—OFFICE—Delaware State Bd. Health, Dover, plans by Pope & Kruce, 911 Washington St., Wilmington, office building. **$2,000,000.**

▲ **Ill., Alton**—SCHOOL—Bd. Educ., Alton Community Unit School Dist. 11, voted **$1,690,000** bonds Sept. 21, constr. new elementary school bldg. and addns. to Mark Twain, Fosterburg, Rufus Easton, Lincoln, Washington and Humboldt Schools. Albert M. Goedde, 100

(Continued on page 370)

Don't Delay Jobs Because of Cold...

Clayton SUMMERAIRE

Keeps Jobs Moving

UP TO 375,000 BTU'S

SERIES "300" MODEL ▲

Capacity: 320,000 to 375,000 BTU's per hr. Fuel tank capacity, 25 gals.; sufficient for 10 hrs. continuous operation.

SERIES "120" MODEL ▼

Output: 120,000 BTU's per hr.; 950 cu. ft. heated air per minute. Burns less than 1 gal. low cost fuel per hr.

Make Your Own Climate;

Keep Equipment and Materials Moving

Avoid costly delays caused by cold weather; frozen materials and equipment. The Clayton SUMMERAIRE portable space heater provides made-to-order climate — safe, controlled and economical. Summeraire protects concrete against freezing while curing, heats semi-enclosed working areas, insures fast starting of power equipment.

SAFE, ODORLESS HEAT AT LOW COST

TWO SIZES; FOUR MODELS TO MEET EVERY NEED

Series "300" models are available with either electric or gasoline engine drive; with or without thermostatic flame control for maintaining pre-set temperatures. Series "120" units provide a highly efficient medium capacity heater. All have outstanding safety features; enclosed, baffled combustion chambers to eliminate open flame hazards; automatic fuel shut-off in the event of flame or power failure; odorless operation with no carbon monoxide release. Ask for prices and complete details.

CLAYTON MANUFACTURING CO. ENR-10-7

Box 550, El Monte, Calif.

( ) Send complete Summeraire literature.

( ) Name of nearest dealer who will demonstrate.

NAME__________

ADDRESS__________

CITY__________STATE__________

Build 2-mile dike for irrigation canal

On St. Mary's River Project, near Cardston, Alberta, Ludwig Construction Co. Ltd., Calgary, built a 2-mile earth-fill dike as one side of a much-needed irrigation canal. Three fast-loading "C" Fullpaks were rented from George Ludwig Limited. Push-loaded, these low, wide rigs heaped estimated 15 yards of wet clay and rock from a hillside cut, in average 50 seconds, over a distance of 100-125 feet. Dirt was hauled down steep 24% grade . . . then up 5% slope. The return route included a 1000′ climb up a 16½% grade.

Want to get bigger payloads in less time?

The 18-yd. LeTourneau-Westinghouse "C" Fullpak* gets a big, low-void payload at every pass . . . delivers volume pay-dirt to the fill at a steady, profitable rate. Here's how this low, wide Fullpak scraper cuts dirtmoving costs:

Most power used for cutting

When loading, scraper wheels ride inside 9½′ cutting width . . . hold flat-bottom bowl low, angled at only 2°. Dirt flows in easily, almost horizontally. With bulk of power used for cutting — little for lifting — rig heaps fast, packs in the last yard almost as easily as the first.

Live "boil" adds to heap

Dirt slides in easily to fill corners, "boils" up with thrust of incoming material. Curved plate on top of tailgate rolls material forward to heap *high and wide.*

Easy loading in tough conditions

6′1″ high apron-lift permits fast loading and unloading of chunky materials. Quick-release clutch on hoist motor lets your operator rapidly "pump" bowl up and down . . . helps get big loads in loose material. Streamlined bowl construction makes it easy to load next to vertical banks and around obstructions.

Good visibility speeds operation

Low yoke gives operator better visibility. He can easily see when pusher is lined-up . . . can apply full power immediately. It's easy to control blade and apron for fast loading.

Unloads all material fast

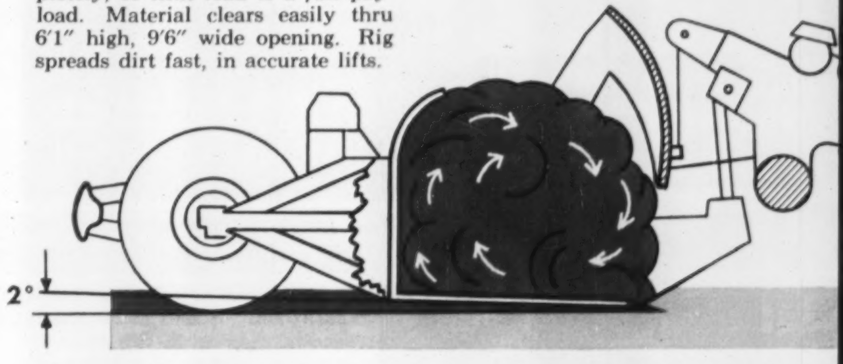
Positive-ejection tailgate pushes straight forward, cleans out even the stickiest muck. Bowl empties completely, so next load is a *full* payload. Material clears easily thru 6′1″ high, 9′6″ wide opening. Rig spreads dirt fast, in accurate lifts.

Extra-cycle . . . more profit

Each rough-trip, Fullpak saves time in the cut, more time on the fill. It completes more cycles — with bigger loads — than other comparable self-propelled scrapers. This added production is *all profit,* because "C" Fullpak costs you no more . . . yet gives lower per-yard operating costs.

See for yourself

Call or write us, and we'll be glad to arrange for you to see Fullpak at work, on a job in your area.



Wheels trailing in scraper's cut, Fullpak bowl hugs ground. Dirt enters almost horizontally . . . rolls back easily to fill corners. Curved top on tailgate keeps load "boiling" to heap *high and wide.* Low push-block gives straight-line low-angle push to blade. *Trademark CP-1241-A-b

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

(Continued from page 368)

Signal Hill Blvd., East St. Louis, Ill., and 3205 Broadway, Alton, Ill., archt. CD 9/6.

▲ **Ill., Elmhurst**—SCHOOL—School Dist. 46, 145 Arthur St., plans by Cone & Dornbusch, 100 N. LaSalle St., Chicago, 1 and 2 story brick Elmhurst Junior High School, Butterfield Rd. and Washington St., **$1,805,000**; 1 story brick elementary school, Butterfield Rd., **$581,000**. CD 3/2/54.

▲ **Ind., Indianapolis**—STATE OFFICE—State Office Bldg. Comn., State Dpt. P. Wks. & Supply, Indianapolis Ind., plans by Raymond S. Kastendieck, 673 Broadway, Gary, Ind. and Graham, Anderson, Probst & White, 80 E. Jackson St., Chicago, Ill., state office bldg. **$20,000,000**. CD 12/16/53.

Ind., LaPorte—SCHOOL—Pleasant-Washington & Scipio Twp. Bldg. Corp., 105 Woodward St., plans by Roy A. Worden & Assocs., 314 W. Colfax St., South Bend, Consolidated High School, **$600,000**.

▲ **Iowa, Davenport**—SCHOOLS—Bd. Educ., Administration Bldg., voted **$3,400,000** bonds Sept. 24, schools. CD 6/5.

▲ **Md., Laurel**—HOUSING, etc.—D. C. Govt., Bldgs. & Grounds, Municipal Bldg., Wash., D. C., plans by George M. Ewing, 1026 Connecticut Ave. N. W., Wash., D. C., staff housing, incinerator, 2 junior cottages, nursery cottage and detention cottage. **$1,500,000-$2,000,000**.

▲ **Mich., Eloise**—HOSPITAL—Bd. Supervs. Wayne Co., City-County Bldg., Detroit, Mich., plans by Smith, Hinchman & Grylls, Inc., 800 Marquette Bldg., Detroit 26, Mich., Wayne County General Hospital, incl. hospital unit, county health bldg. and laundry. **$15,000,000**. CD 3/20/56.

Mich., St. Claire Shores—SCHOOL—City, St. Claire Shores South Lake Schl. Dist., 23700 Mack Ave., voted bonds Sept. 23, elementary school. **$700,000**.

▲ **Minn., Minneapolis**—AUDITORIUM WINGS—City, L. A. Johnson, clk., City Hall, plans by Lang & Raugland, 802 Wesley Temple Bldg., Magney-Tusler & Setter, 303 Roanoke Bldg. and McEnary & Krafft, 920 McKnight Bldg., east and west wing to existing municipal auditorium, E. Grant St. between Stevens Ave. and 3 Ave. S. **$4,000,000**. To go ahead in 1958. CD 2/20/56.

▲ **Mo., Neosho**—HOSPITAL—Newton County Hospital Comn., Neosho, county hospital. **$1,730,000**. Will apply for $750,000 Federal grant. CD 9/27.

▲ **N. Y., Brooklyn**—SCHOOL—Bureau Constr. Bd. Educ., 42-15 Crescent St., Long Island City, plans by Raymond Irrera & Assoc., 42-15 Crescent St., Long Island City, 3 story, P. S. 74, 114-46, Kosciusko St. **$2,450,000**. CD 5/20.

▲ **N. C., Elizabeth City**—HOSPITAL—Bd. Comrs. Pasquotank Co., J. G. Spence, clk., Elizabeth City, referendum voted Sept. 21, hospital. **$2,225,000**. CD 6/16/53.

N. D., Bismarck—SCHOOL—Bd. Educ., Bismarck, plans by Ritterbush Bros., Bismarck, Edmund A. Hughes Junior High School. **$500,000**. CD 7/22.

▲ **O., Bedford**—SCHOOL—Bedford Bd. Educ., 91 Tarbell, bond election Jan. 21, school addns. **$1,310,000**. CD 5/11/56.

▲ **O., Bexley**—SCHOOL—Bexley Bd. Educ., 326 S. Casingham St., Columbus, defeated bonds Sept. 27, high school addn. **$980,000**; natatorium to be built at high school, **$250,000**.

Okla., Norman—SCHOOL—Bd. Educ., Norman, voted bonds, high school. **$625,000**. CD 8/18/55.

Pa., Connellsville — HOSPITAL — General State Auth., 18th and Herr Sts., Harrisburg, 50-bed addn. to Connellsville State Hospital. **$800,000**. CD 1/2.

Pa., Fallsington—SCHOOL—Pennsbury Joint School Dist., Fallsington, Secondary School. **$750,000**.

▲ **Pa., Harrisburg**—EXHIBIT—General State Auth., 18th and Herr Sts., project concelled, addn. to exhibition building and new roof for large arena at State Farm Show. **$1,200,000**. Joseph F. Bontempo & Assoc., 115 Shields St., Rochester, archt. CD 1/28.

Pa., Kulpsville—SCHOOL—Towamencin Twp. School Dist., Kulpsville, plans by Mr. Charles Talley, Telford, elementary school addn., Towamencin Twp. **$545,000**.

Pa., Lincoln University—PHYSICAL SCIENCE—General State Auth., 18th and Herr Sts., Harrisburg, physical science building for Lincoln University. **$600,000**. CD 11/3/55.

† **Pa., New Kensington**—TRAINING CENTER—U. S. Eng., 925 Federal Bldg., Pittsburgh, 1 story, 19,560 sq. ft., brick load bearing walls, Army Reserve Training Center, **$500,000**. Green Eng. Co., 504 Beaver St., Sewickley, archt.

▲ **Pa., Phila.**—HOSPITAL—General State Auth., 18th and Herr Sts., Harrisburg, plans by Engineers Consultants, 843 N. 19th St., tuberculosis hospital, Countham Ave. **$3,000,000**. Keast & Hood, 2031 Chestnut St., consult. engrs. CD 10/17/56.

▲ **Pa., Pittsburgh**—ARENA-AUDITORIUM—City, Zone 19, plans by Mitchell & Ritchey, consult. engrs.-archts., Plaza Bldg., arena, auditorium, with retractable roof, seating cap. 14,000. **$19,000,000**. Bids in November.

▲ **Pa., Slippery Rock**—GYMNASIUM, etc. — General State Auth., 18th and Herr Sts., Harrisburg, field house and gymnasium for Slippery Rock State Teachers' College. **$1,200,000**. Funds allocated. CD 12/6.

Pa., Waynesburg—HOSPITAL—Greene County Memorial Hospital, wing for existing hospital. **$750,000**.

▲ **Tex., Commerce**—LIBRARY, etc.—East Texas State College, Commerce, library, **$1,714,020**; business administration, **$480,071**; plant operation dpt. bldg., **$487,600**.

▲† **Tex., Corpus Christi**—COURTHOUSE—Nueces Co., c/o Courthouse, courthouse, **$2,000,000-$3,000,000**.

▲† **Tex., El Paso**—HOUSING—U. S. Eng., Box 1538, Albuquerque, N. M., 125 Capehart Housing units for Wm. Beaumont General Hospital, **$1,000,000-$5,000,000** bids late December.

▲ **Tex., Marshall**—COURTHOUSE—Harrison Co., c/o Coms., Court, bond, election Nov. 5, courthouse, **$1,000,000**. CD 10/31/56.

▲ **Tex., Spring Branch**—SCHOOLS—Spring Branch Ind. School Dist., 9000 Westview, bond election Oct. 5, Natural Science Laboratory, **$350,000**; elementary school, Northwest area, **$425,000**; elementary school, Woodview area, **$400,000**; unit to Spring Branch Sr. High School, **$900,000**; elementary school, memorial Bend area, **$500,000**. CD 11/7/55.

▲ **Utah., Logan**—SCHOOL—Utah State Building Bd., 419 State Capitol, Salt Lake City, Applied Sciences Bldg., at State University, **$2,350,000**. CD 8/6.

▲ **Va., Vienna**—SCHOOL—Fairfax Bd. Educ., Fairfax, plans by Dixon & Norman, 1103 E. Main St., Richmond, high school. **$1,600,000**. CD 1/11/55.

Wis., Luxemberg—SCHOOL—Union High School Dist., plans by Maury Lee Allen, Zuelke Bldg., Appleton high school, **$750,000**.

▲ **Wis., Verona**—HOSPITAL—Dane Co., Madison, plans by Law, Law, Potter & Mystrom, 121 S. Pinckney St., Madison, hospital addn., **$1,000,000**.

Wyo., Sheridan—COLLEGE—Sheridan Community College, James Spacklen, pres., plans by Goodrich, Wilking, 722 E. Yellowstone, Casper, Community College, **$800,000**.

▲ **Ont., Brantford**—RESIDENCE, etc.—Brantford General Hospital, Terrace Hill and Ontario St., plans by Harold J. Smith, 62 Charles St. E., Toronto, nurses' residence and school. **$1,017,000**. Wallace, Carruthers & Assocs. Ltd., 92 Yorkville Ave., Toronto, consult. engrs. CD 5/5/52.

COMMERCIAL BUILDINGS

▲ **Calif., Atherton**—COUNTRY CLUB—Owner, c/o Irvin W. Goldstine, archt., 633 Oak Grove Menlo Park, stone, stucco, redwood and glass country club bldg., incl. swimming pool, etc. **$1,000,000**.

▲ **Calif., Fresno**—OFFICE—Pacific Telephone & Telegraph Co., 1456 Van Ness Blvd., 4 story central office bldg. **$1,800,000**.

(Continued on page 372)

PRIME-MOVER M15A FOR BUILDING CONSTRUCTION Places 12 to 17 cu. yds. of concrete per hour on school, hospital and commercial projects — *without* extensive preparations for its use. Runs on same type of ramps, hoists and runways as hand carts. Available with flatbed, or 10 cu. ft. bucket.

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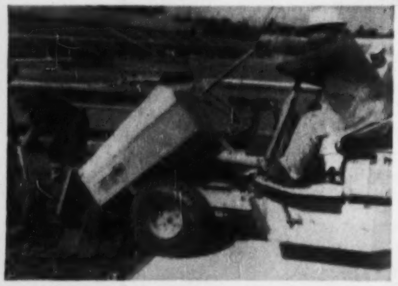

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Hauls 2/3 yard or 1-1/2 tons. Unloads transit mixers fast. Spots concrete right where it's needed on plant, warehouse, pier and bridge construction. Hydraulic Torque Converter Drive frees the operator from shifting, clutching and wasted effort. Rugged, dependable. Bucket and flat bed.

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A special interview

How ABRASIVE SAND problem was solved by rubber-tired tractor

AUBUCHON
SILICA MINING CO.
Festus Mo.

You've probably seen the damage sand can do to your equipment . . . grinding away at exposed parts of earthmoving units. One machine — rubber-tired Tournatractor® — resists abrasion so well, however, that it's now the standard tractor in many sand areas. If, in your dirt-moving, your tractors frequently work in sand, or other abrasive materials, read what a sandpit superintendent — Ira Kent, Aubuchon Silica Mining Division of Portage-Manley Sand Co. at Festus, Mo. — has to say.

Q. *"Mr. Kent, why did you choose Tournatractor?"*

A. "There's a lot of sharp silica sand around here, and much of our work is on rocky surfaces. When we used crawlers, we had a major problem in track maintenance. Our sand in those tracks worked just like a grinding compound. We had continuous pad and roller trouble. So we bought a Model C-2 Tournatractor in 1950, and liked it so much we bought our present improved Tournatractor in '52."

Q. *"What sort of work does your Tournatractor do?"*

A. "We use it for just about everything. Its main jobs are stripping overburden and cleaning up around our shovels. It also builds and maintains haul roads, takes out trees, pulls heavy equipment, and does a lot of clean-up after blasting. Actually, we've found that we don't have *any* tractor jobs that our Tournatractor can't do."

Q. *". . . and what has the maintenance record been, Mr. Kent?"*

A. ***"Well, we've worked our Tournatractor 45 hours a week for almost 5 years, without any real trouble. Our one and only major repair expense in all that time has been replacement of the torque-converter oil-seal and bearings. We've never done anything to the engine . . . not even replacing an injector or anything. We never broke an axle, chipped a gear, or had a single major thing go wrong."***

Q. *"What about the electrical system and its maintenance?"*

A. "We like this electric control system . . . and it's never given us any trouble. In all this time, we have put in only one set of discs in the motor brakes, and two little switches. But that's it, so far as repairs are concerned."

Q. *"And the tires?"*

A. "Our present Tournatractor front tires are still the originals. We replaced the two back ones last spring, after better than 4 years of service. We've never had a blow-out, on any of the four. As to changing or repairing tires — you know that on Tournatractor, changing a tire is as easy as changing an 8.25 truck tire. That's another thing we like about this dozer. Lots easier than fixing track troubles."

Tournatractor's wide, low-pressure tires flex easily over sharp rocks without cutting . . . end age-old problem of rocks, sand, and dust clogging up track assembly.

One of many spare-time jobs handled by Tournatractor is building new haul road. Operator takes overburden dirt, drifts it on down to bottom, building up road grade.

Pit Mgr. Kent says: "Main reason we like our rubber-tired Tournatractor is its go-anywhere ability. It's quick on its feet . . . handles easier . . . maneuvers easier."

This owner-verified work report indicates how Tournatractor can solve your costly abrasion problem. Rolling on big rubber tires . . . with all parts sealed and protected against damage by rocks, sand, and other harmful materials . . . it gives you years of low-cost, trouble-free service. See your nearby LeTourneau-Westinghouse Distributor for full details and a working demonstration.

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LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

(Continued from page 370)

▲ **Calif., Oakland**—HOTEL, etc.—Dal Webb, S. 23rd Ave., Phoenix, Ariz., 7 story hotel, off street parking, swimming pool, etc. **$4,000,000-$5,000,000.**

▲ **Ga., Atlanta**—MOTEL-RESTAURANT—Northside Motel, Inc., 66 Eleventh St. N. E., plans by, Designs, Inc., 906 Sidney, St. Louis, Mo. Howard Johnson Motel-Restaurant, Northside Dr. and Northwest Expressway. **$1,125,000.**

▲ **Ill., Midlothian**—APARTMENT—Max Siegalle, c/o Shayman & Salk, archts., 5844 N. Lincoln Ave., Chicago, 128 unit apartment, 147th and Homan. **$1,500,000.**

▲ **Ill., Skokie**—RESTAURANT—Stouffer Corp., 26 W. Madison St., Chicago, restaurant on 3½ acre site NW corner Skokie Blvd. and Grosse Point Rd. **$2,000,000.**

Kan., Overland Park—MOTEL, etc.—Glen W. Dickinson, Jr., 4015 West 57th St., Mission, 2 story motel, swimming pool, restaurant, etc. at Hy. 69 and 92nd St., **$800,000.** CD 7/8, under Kan., Overland.

Kan., Overland Park—HOTEL, etc.—Mrs. Tena May Dowd, through Beck Cross Hotel Co., 5920 Nall Ave., plans by Neville, Sharp & Simon, 12 E. 12th St., Kansas City, Mo., 3 story hotel, swimming pool at U.S. No. 50 and Johnson Dr. Over. **$500,000.**

▲ **Kan., Toronto**—HOTEL—Lake Shore Development Co., Toronto, plans by Buck & Lewis, Emporia, resort hotel, bordering Toronto Reservoir. **$1,200,000.**

Ky., Mt. Sterling—HOSPITAL—The Mary Childs Hospital Bd. Trustees, plans by Frankel & Curtis, 130 Barr St., Lexington, 1 and 2 story, brick hospital addns., alterations. **$600,000.**

▲ **Me., Lewiston**—HOSPITAL—St. Mary's General Hospital, 318 Sabattus St., plans by Leo F. Provost, 61 Amherst St., Manchester, N. H., 4 story, 248x40 ft. and 158x40 ft. hospital addns. **$2,000,000.** Frank H. Whelan, 11 Beacon St., Boston, Mass., consult. engr. CD 12/4.

▲ **Md., Baltimore** — DORMITORY — College of Notre Dame, North Charles St., plans by Paul L. Gaudreau (Gaudreau & Gaudreau), 330 N. Charles St., Zone 1, dormitory. **$1,040,000.** CD 9/9.

▲ **Minn., Minneapolis**—OFFICE—Baker Properties, Inc., Baker Bldg., and J. C. Penney Co., Inc., A. L. Remington, mgr., 2025 Nicollet Ave., plans by Larson & McLaren, Foshay Tower, remodeling all three office buildings in east side of Nicollet Ave. removing fifth floor of north building and fifth and sixth floor of center bldg., refacing exteriors of three buildings, and modernizing interiors, etc., **$1,500,000.** CD 11/17/55.

▲ **Mo., Jennings (St. Louis, 20, P. O.)**—MEDICAL—G. J. Nooney & Co., Railway Exchange Bldg., 611 Olive St., St. Louis, Zone 1, plans by Russell, Mullgardt Schwarz, Van Hoefen, Chemical Bldg., 721 Olive St., St. Louis, Zone 1, 3 story, 30,000 sq. ft. brick, stone, concrete, metal, glass medical bldg. and 1 story annex, to contain Northland Bank, incl. drive-in banking windows, etc. in Northland Shopping Center, W. Florrisant Ave. and Lucas and Hunt Rd., **$1,000,000.**

▲ **N. J., Linwood**—OFFICE, etc.—Prudential Life Insurance Co. of America, 763 Broad St., Newark, plans by Frank Grad, 1180 Raymond Ave., office building and parking area. **$1,500,000.** Farkas & Barron, 150 Broadway, New York, N. Y., consult. engrs. CD 9/17.

N. J., Trenton—ACCOUNTING—New Jersey Bell Telephone Co., 540 Broad St., Newark, plans by Frank Grad & Son, 1180 Raymond Blvd., Newark, revenue accounting bldg. **$500,000.** Farkas & Barron, 150 Broadway, New York, N. Y., consult. engrs. CD 9/6/56.

N. J., Troy Hills—SCHOOL, etc.—Church of St. Peter the Apostle, Troy Hills, plans by Fanning & Shaw, 49 Ward St., Paterson, school and convent. **$600,000.**

▲ **N. Y., Levittown**—STORES, etc.—Irving Berger, 3000 Hempstead Turnpike, plans by A. H. Salkowitz, 87-25 Homelawn St., Jamaica, Zone 32, stores, office and apartment, Hempstead Turnpike and Center Lane. **$1,000,000.**

▲ **N. Y., New York**—APARTMENT—Albert & Harrison, 15 E. 48 St., Zone 17, plans by Leo Stillman, 332 E. 149 St., Zone 51, apartment, York Ave., N.E.C. of 77 St. **$1,000,000.**

▲ **N. Y., New York**—APARTMENTS—M.G.W., Inc., c/o Samuel Paul, archt., 89-51 164 St., Jamaica, two 9-story apartment bldgs., Fieldstone Rd., southeast corner of 256 St. **$2,100,000.**

▲ **O., Reynoldsburg** — SHOPPING CENTER — Don. M. Casto & Assoc., 42 S. Fourth St., Columbus, shopping center, 41-acre site, Route 40. Over **$1,000,000.**

▲ **Pa., Bala Cynwyd**—APARTMENT, etc.—Enokay Inc., c/o Herman Krokovitz, 1420 Walnut St., Phila., plans by Samuel I. Oshiver, archt.-consult. engr., 1913 Walnut St., Phila., apartment, and garage Conshohocken State Rd. **$2,000,000.**

Pa., Carlisle — Y.M.C.A. BLDG. — Y.M.C.A., 2 Market House Ave., plans by Paul C. Reed, 215 S. Hanover St., Y.M.C.A. bldg. **$600,000.** Bids next Spring.

▲ **Pa., Doylestown**—HOSPITAL—Doylestown, Pa. Eemergency Hospital, plans by Lawrie & Green, 321 N. Front St., Harrisburg, hospital wing. **$1,500,000.**

Pa., Media—SCHOOL—Williamson Freed School of Mechanical Trades plans by Massena & DuPont, 704 Delaware Ave., Wilmington, school addns. **$500,000.** Bids soon.

Pa., Phila.—HOSPITAL—The Shriners Hospital for Crippled Children, Roosevelt Blvd. and Pennypack Park, plans by The Ballinger Co., consult. engr.-archt., 1625 Race St., hospital addns., alterations. **$800,000.**

Pa., Phila.—SHOPPING CENTER—Albert Toll, 7744 Washington Lane, Elkins Park, plans by Aaron Colish, 117 S 17th St., shopping center, Ogontz Ave. **$750,000.**

▲ **Pa., Pittsburgh**—MOTOR HOTEL—Arrington Corp., Standard Life Bldg., plans by Liff & Justh, archts.-consult. engrs., Standard Life Bldg., 4 story, Haddon Hall Motor Hotel, (hotel-motor court combination). **$1,000,000.**

▲ **Tex., Austin**—MOTOR-HOTEL, etc.—L. L. McCandeless Constr. Co., 1215 S. Congress Ave., motor hotel, **$900,000;** restaurant-club, **$350,000,** Inter-regional Hy. between E. 23½ and 24 Sts.

Tex., Fort Worth—MEDICAL ARTS—Jesse H. Jones Interests, c/o Clay Berry, mgr., Fair Bldg., Medical Arts Bldg. **$600,000.** Palmros Eng. Co., Oil & Gas Bldg., consult. engr.

▲ **Tex., Houston**—STORE, etc.—Montgomery Ward & Co., 6200 St. John St., Kansas City, Mo., 1 and 2 story, 200,000 sq. ft. 20,000 open type covered selling area store for Greater Houston area, incl, a service station. **$2,000,000,** constr. after Jan. 1, 1958.

▲ **Utah, Logan**—SCHOOL—Utah State Building Bd., 419 State Capitol, Salt Lake City, Applied Sciences Bldg., at State University, **$2,350,000.** CD 8/6.

▲ **Wash., Seattle**—OFFICE—Antero, c/o Bullitt Co., 1411 4 Ave., Zone 1, plans by Mandeville & Berge, Vance Bldg., Zone 1, 12 story, 115 x 120 ft. office bldg., Fifth Ave. and Union St. **$3,000,000.** Work to start early next year.

▲ **Wis., Kenosha**—COLLEGE CAMPUS—Carthage College, Carthage, Ill., college campus. **$5,000,000.** Start in 1958.

▲ **Alta., Calgary**—OFFICE—The Alberta Wheat Pool, Loughheed Bldg., constr. 10 or 12 story office bldg., 5th Ave. and 2nd Sts. S.W. **$1,000,000.**

Ont., London—APARTMENT—A. Bernardo, 290 St. James St., 84 unit apartment, Huron St. **$500,000.**

▲ **Ont., Toronto**—APARTMENTS—M. Atkin, 29 Timberlane Dr., apartments, 225 suites, with partial underground parking and recreational services, 3½ acre site area bounded by Lakeshore Rd., 7th, 8th, and Birmingham Sts., in New Toronto. **$2,000,000.**

Ont., Toronto—APARTMENT—452 Eglinton Ave. E. Ltd., plans by E. I. Richmond, 455 Spadina Ave., apartment, rein.-con. fdn., **$750,000.**

Ont., Toronto—APARTMENTS—Monarch Constr. & Realty Ltd., 606 Jarvis St., plans by Henry Fliess, 501 Young St., 52 family maisonette apartments, Kipling Ave. and Brookmere Rd. area. **$500,000.**

Que., Three Rivers—SCHOOL ADDNS.—Ecole Technique des Trois Rivieres, Three Rivers, Technical school addns. and repairs, Rue St. Francois Xavier. **$800,000.**

▲ **Sask., Saskatoon**—HOSPITAL—St. Paul's Hospital Bd. Governors, Saskatoon, 320-bed hospital. **$5,000,000-$6,000,000.** CD 5/28/53.

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The R. D. Wood Standard Swivel Joint Hydrant gives you the most for your money in strength, reliability and sound design. The *all-bronze stuffing box,* gland and operating nut prevent rust and corrosion. Internal friction which might lower pressure is reduced to well below A.W.W.A. specifications by tapered nozzleways and carefully rounded changes in diameter.

Breakable Flange and Stem Coupling

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Extension Piece

Can be inserted without interrupting water flow.

Hydrants now available with O-Ring Seal when specified

INDUSTRIAL BUILDINGS

Conn., Danbury—PLANT—Viking Wire Co., 13 River St., plant for mfg. wire, Triangle St. **$500,000,**

▲ **Ill., Chicago**—MILL—Interlake Iron Corp., Union Commerce Bldg., Cleveland, O., steel mill expansion. **$40,000,000.** Arthur G. McKee, 2300 Chester Ave., Cleveland, O., consult. engr. CD 2/3/56.

▲ **Iowa, Dubuque**—PLANT—Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., manufacturing plant. **$10,000,000.** CD 9/11.

▲ **O., Rayland**—GENERATOR STATION—Cleveland Electric Illuminating Co., Public Square, Cleveland, Zone 13, 335,000 KW generator station, **$75,000,000.**

O., Toledo—WAREHOUSE, etc.—Walding, Kinnan & Marvin Co., 332 Summit St., drug warehouse and offices, Nebraska Ave. near Westwood Ave. **$800,000.**

▲ **Tenn., Memphis**—FREIGHT HOUSE—St. Louis-San Francisco Ry., B. H. Crosland, ch. engr., 309 N. Jefferson St., Springfield, Mo., freight house in railroad's Yale Yards. **$1,500,000.** Constr. next 6 months.

▲ **Tex., Abilene**—POWER PLANT—West Texas Utilities Abilene Co., addnl. power plant and facilities. **$7,000,000.** Sargent & Lundy, 140 S. Dearborn, Chicago, Ill., consult. engrs. CD 9/13/57, under Texas.

▲ **Tex., Bellaire**—LABORATORY—The Texas Co., 720 San Jacinto, Houston, 20 acre tract, laboratory expansion. **$5,000,000.** To be built in 3 or 4 units over period of time starting in 1958.

Tex., Houston—PLANT—Proler Steel Corp., 5201 Clinton Dr., plant (tin shredding). **$500,000.**

▲ **Tex., Texas City**—PIPE MILL—Texas Rolling Mills, Inc., c/o R. I. Sample, 3806 Olympia St., Houston, pipe mill proj. for Plant "A" **$1,500,000,** Constr. 1957; Plant "B" **$4,000,000,** Constr. early 1958 in Texas City Old Tin Smelter area. Little, Berry & Schact, c/o owner, consult. engrs.

▲ **Tex., Texas City**—PLANT—The Wah Chang Corp., c/o Tom Mackey, engr., Texas City, Tex., (233 Broadway, New York, N. Y., Hdqrs.) extension of renovation work on old Texas City Tin Smelter plant to produce tin, tin alloys, and tungsten products. **$2,500,000.** CD 1/18.

▲ **Alta., Okotoks**—PLANT—Devon-Palmer and Shell Co. of Canada Ltd., 25 Adelaide St. E., Toronto, Ont., sulphur extraction plant producing 300 long tons sulphur daily. **$1,800,000.** CD 6/12/53.

▲ **Ont., Sault Ste. Marie**—PLANT EXPANSION—Algoma Steel Corp. Ltd., Queens St. W., plant expansion, incl. oxygen blower plant to replace open hearth and erecting bloom and pipe mill, Over **$1,000,000.** Foundation of Canada Eng. Corp., Ltd., 200 Bay St., Toronto, consult. engrs. CD 11/29/55.

Que., Three Rivers—PLANT—Mack Trucks of Canada Ltd., 2150 Cote de Liesse Rd., Montreal, assembly plant to produce trucks, etc., on 50 acre site, Rue Pere Daniel. $750,000.

UNCLASSIFIED

† **Florida**—PARK ROADS—National Park Service, Dpt. Interior, Interior Bldg., 19 and C Sts. N.W. Wash. 25, D. C., grading, base surf. approx. 13 mi. Park Hy. Rte. 1 completion of Gap from junction with Rte. 4 Everglades National Park **$600,000** appropriated.

Iowa, Des Moines—SWIMMING POOLS—City, City Hall, 2 swimming pools. **$655,000.**

▲† **Maryland and Virginia**—PARK ROADS—National Park Service, Dpt. Interior, Interior Bldg., 19 and C Sts. N.W., Wash. 25, D. C., completion, grading, structures, George Washington Parkway D. C. Line to Great Falls, Md., **$2,000,000;** grading Rte. 1, Langley to Great Falls, Va., **$900,000;** access roads and parking areas, Ft. Washington, Md., **$100,000;** access roads and parking, Belle Haven, Va. **$92,000.** Total est. $3,092,000 appropriated.

▲† **Mississippi and Tennessee**—PARK ROADS—National Park Service, Dpt. Interior, 19 and C Sts. N. W., Wash. 25, D. C., Proj. 3J, grav. base course and 3 parking areas, French Camp-Chester-Tomnolen Rd., **$269,000;** Proj. 3H; J., bit. paving Miss. Hy. 413, U. S. 82, R87, 88, **$473,900;** Proj. 3E, 6 bridges, R-74, **$330,000;** Proj. 3E, Seven county road separations, **$262,500;** Proj. 3E, hy. 41 overpass, R-77, **$55,000;** Proj. 3F1, 2, grading, etc. Houlka-Van Fleet Rd. to Woodland-Montpelier Rd., R-79, and 82, **$1,812,500;** Proj. 1G, Little Buffalo River Bridge, **$572,000;** Proj. 1G, two grade separations, R-292, **$87,500;** Proj. 1G, U. S. 64 overpass R-10, **$125,000.** Natchez Trace Parkway. Funds appropriated. CD 3/6/56.

Missouri—RURAL TELEPHONE SYSTEM—Mark Twain Rural Telephone Co., Bethel, rural telephone sys. extens., imprvs. in Knox, Shelby Adair and Lewis Counties, **$900,000,**

▲† **North Carolina**—Tennessee—PARK UTILITIES—National Park Service, Dpt. Interior, 19 and C Sts. N.W., Wash. 25, D. C., reconstr. approx. 3 mi. Newfound Gap to Kaphart Prong, **$547,600;** lining for Tunnel No. 1, Newfound Gap Highway, **$147,000;** entrance road to Campground, Cosby, **$86,600;** roads and parking spurs, Cosby Campground, **$73,800.** $855,000 appropriated. CD 5/14/56.

† **Pennsylvania**—CYCLORAMA BLDG.—National Park Service, Dpt. Interior, 19 and C Sts. N.W., Wash. 25, D. C., cyclorama Bldg., Gettysburg National Military Park. **$528,800** appropriated.

Tex., Pasadena—RAILROAD TRACK REMOVAL—Harris Co., c/o Courthouse, Houston, moving 5 mi. railroad track from Sinco St., Pasadena to Channel City Rd. **$750,000.**

† **Utah**—PARK IMPRVS.—National Park Service, Dpt. Interior, 19 and C Sts. N.W., Wash. 25, D. C., grading, base course, surface and bridge, Monument entrance road, Arches National Monument. **$700,000** appropriated.

▲† **Virginia and North Carolina**—PARK BRIDGES—National Park Service, Dpt. Interior, Interior Bldg., 19th and C Sts. N.W., Wash. 25, D. C.

surface treatment and completion of Oconaluftee River Bridge, 2Y, Z, 70, **$299,800** appropriated.

grade separation 2A, NC 18, R-270 **$125,000** appropriated.

grade separation, 2J-10, NC 181, R-274. **$156,000** appropriated.

IN, six structures, R-160. **$550,000** appropriated above work. Blue Ridge Parkway (part of Mission 66 Program). CD 5/14/56

▲† **Virgina and North Carolina**—PARK ROADS—National Park Service, Dpt. Interior, Interior Bldg., 19 and C Sts. N.W., Wash. 25, D. C.,

2x1, 2, 3, grading, stone base and overpass, Balsam Gap to Soco Gap, R-206, 245, 246. **$2,708,000** appropriated.

2V-7 retaining walls, R-498. **$20,000** appropriated.

2UV, bit. paving, Wagon Rd., Gap-Beech Gap, R-419. **$200,000** appropriated.

Inl, 2, 3, grading and base course, US 220 to Adney Gap. **$1,963,000** appropriated above work. Blue Ridge Parkway (part of Mission 66 program). CD 5/14/56.

† **Washington**—PARK BRIDGES—National Park Service, Dpt. Interior, 19 and C Sts., Wash. 25, D. C., reconstr. Shaw Creek Bridge, White River Rd., **$41,200;** reconstr. Panther Creek Bridge, **$125,000;** constr. Nisqually River Bridge and approaches **$550,000** above work at Mt. Rainier National Park, (part of Mission 66 project). Funds appropriated. CD 1/30.

† **Washington**—PARK ROAD—National Park Service, Dpt. Interior, 19 and C Sts. N.W., Wash. 25, D. C., constr. 13.1 mi. Heart 08 the Hills Road, Olympic National Park. **$876,000** appropriated.

▲ **Wash., Seattle**—TERMINAL, etc.—Port of Seattle, Bell St. Terminal, Zone 1, rebuild Ames Terminal, **$1,350,000;** shop bldg. to replace existing port shops at E. Marginal Way between Hinds and Horton Sts., **$150,000.** Work to start next year. CD 3/13/47.

▲† **Wyoming**—PARK ROADS, etc.—National Park Service, Dpt. Interior, 19 and C Sts. N.W., Wash. 25, D. C., 2 bridges and approaches, North Entrance Rd., **$382,000;** grading, base surf. 14 mi. West Entrance Road and Madison River Bridge and approaches, **$860,000,** Yellowstone National Park. Funds appropriated. CD 7/19/55.

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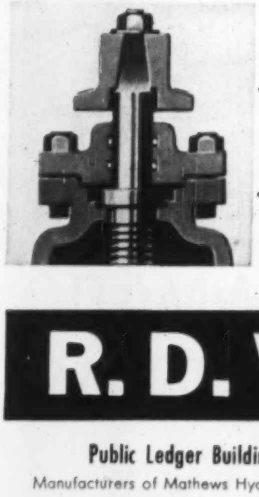

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NEW ENGLAND

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS

BRIDGES
October 22 Massachusetts

STREETS AND ROADS
October 22 Massachusetts

BUILDINGS—BA

▲ **Conn., Somers**—STATE PRISON—BA 11/13—State P. Wks. Dpt., 165 Capitol Ave., Hartford, State Prison, first stage. **$2,500,000.** Plans deposit $30. CD 5/24/56, under Conn., Hazardville.

HEAVY CONSTRUCTION—LB & CA

▲ **MASSACUSETTS**—Commonwealth of Mass., Dpt. P. Wks., 100 Nashua St., Boston,
C. J. Maney Co., Inc., 173 Bedford St., Lexington, Mass., LB **$1,384,967,** est. $1,644,838, Section 7A, Southeast Expressway, incl. 3 steel stringer bridges, 3 concrete bridges, FAP U-355(3), Weymouth. Bids Oct. 8. CD 9/18.

CONNECTICUT—State Hy. Comn., State Office Bldg., Hartford,
Mariani Constr. Co., 222 Forbes Ave., New Haven, Conn., CA **$658,001,** Proj. 124-90, prestressed concrete bridge over Naugatuck River and approx. 814 lin. ft. b. conc. on Broad and Pine Sts., Route 8A, Seymour. Bids Sept. 9, awarded Oct. 3. CD 9/13, under LB.

BUILDINGS—LB & CA

▲ **J. S. Rand & Son,** 67 Sudbury St., Boston, Mass., LB **$1,240,863,** SENIOR HIGH SCHOOL, MARSHFIELD, MASS. Town, Ellis Rand, chn. Comn., c/o Supt. Schools, New St., Marshfield, Mass. Bids Oct. 4. CD 9/10.

C. A. Batson Co., 26 Arlington St., Brockton, Mass., LB **$496,602,** ELEMENTARY SCHOOL, Ash and Dedar Sts., STOUGHTON, MASS. Town, Elementary School Bldg. Comn., c/o Supt. Schools, Pearl St., Stoughton, Mass. Bids Oct. 4. CD 9/4.

▲ **J. L. Marshall & Sons, Inc.,** 560 York Ave., Pawtucket, R. I. CA **$1,009,481,** est. $1,000,000, JUNIOR-SENIOR HIGH SCHOOL, Phase No. 1, Gravel Bank off Phenix Ave., CRANSTON, R. I. City, Purch. Div., Viola Dawson, purch. agt., Cranston, R. I. Bids Sept. 20. CD 9/25, under LB.

▲ **Birdseye View Manor,** Birdseye Rd., Shelton, Conn., Owner Builds, **$1,330,000.** 133 HOUSES "Birdseye View Manor" Birdseye Rd., SHELTON, CONN.

▲ **American Bridge Div., U. S. Steel Corp.,** 71 Broadway, New York, N. Y., CA **$4,264,358,** furnishing, fabricating, directing structural steel for superstructure of Glastonbury-Wethersfield Bridge across Connecticut River between Glastonbury and Wethersfield, HARTFORD, CONN. Greater Hartford Bridge Auth., 71 Capitol Ave., Hartford, Conn. CD 10/3, under LB.

MIDDLE ATLANTIC

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS

BRIDGES
October 22 New Jersey

STREETS AND ROADS
October 22 New Jersey

New York—BA 10/21—President Richmond Boro, Boro Hall, St. George, Zone 1, N. Y., paving, with 2 in. b. conc. on 4 in. bit. macad. base, concrete curb on both sides where necessary in Lortel Ave. from Slosson Ave. to Melhorn Rd., etc.

N. Y., **White Plains**—BA 10/23—Dpt. P. Wks., Westchester Co., County Office Bldg., Contract 900, connection sewer, Section IV Yonkers Joint Sewer Proj., Yonkers. Plans deposit $15. CD 8/4/54, under N. Y., Yonkers.

† **Pa., Claysburg**—ANTENNA POLES—BA 10/29—Procurement Div., Middletown Air Material Area, Olmsted Air Force Base, erecting antenna poles and associated equipment Claysburg Air Force Base, Proj. No. 36-600-58-53.

† N. Y., **Syracuse**—ANTENNA POLES, etc.—BA 10/30—Procurement Div., Directorate Procurement & Production Middletown Air Material Area, Olmsted Air Force Base, Pa., erecting antenna poles and associated equip. at remote transmitter and receiver sites, Syracuse Air Force Station, Proj. 36-600-58-54. CD 2/29/56.

N. J., **Asbury Park**—BATHING PAVILION—BA 11/6—City, City Hall, 2 story, brick faced masonry bathing pavilion, Fourth Ave. $500,000. Plans deposit $50.

▲ **New York**—BA 11/14—Power Auth. of State of New York, The Coliseum Tower, 10 Columbus Circle, New York 19, N. Y. main power plant of Niagara Power Project in Lewiston near Niagara Falls, Contr. N-3. Plans deposit $50. Extended date. Uhl, Hall & Rich, 230 Congress St., Boston 10, Mass., engrs. CD 8/20.

BUILDINGS—BA

Pa., Austin — SCHOOL — BA 10/31 — Pa. Pub. School Bldg. Auth., 101 S. 25th St., Harrisburg, elementary-secondary school bldg. for Austin Joint School Bd. Plans deposit $35. R. V. Hall, Port Allegheny, archt. CD 12/23/54.

▲ **Del., Wilmington**—HOUSING—BA 11/5—Wilmington Housing Auth., 1400 Todds Lane, 400-unit Riverside Housing. $5,000,000. Pope & Kruse, 911 Washington St., archts. CD 9/13.

▲ **Pa., Quakertown**—SHOPPING CENTER—Bids Asked—Quakertown Shopping Center, Inc., 102 Bryn Mawr Ave., Bala Cynwyd, shopping center, 6 stores with supermarket. $2,000,000. J. Lee Thorne Assocs., 8418 West Chester Pike, Upper Darby, archts. CD 8/7.

HEAVY CONSTRUCTION—LB & CA

▲ **Norn Constr. Co., Inc.,** 2175 Hewlett Ave., Merrick, N. Y., CA **$1,525,120** installing tracks and contact rails, DeKalb Ave., reconstr. Flatbush Ave. Exten. and Fulton St. Bridge to Ashland Pl., Cont. T-122, BROOKLYN, N. Y. New York City Transit Auth., 370 Jay St., Brooklyn 1, N. Y. Bids Sept. 6. CD 9/12, under LB.

Mal Bros. Contg. Co., 38 Highland Ave., Newark, N. J. LB **$656,100.** furnishing, installing wood pile and concrete fdn. for Buildings Nos. 191, 192, 193 and 194, Contr. PN-420.003, PORT NEWARK, N. J. Port of New York Auth., 111 Eighth Ave., New York 11, N. Y. Bids Oct. 8. CD 9/18.

▲ **PENNSYLVANIA**—State Hy. Dpt., 506 North Office Bldg., Harrisburg,
Fred W. Ewing, Inc., 405 W. Main St., Corry, Pa., CA **$2,458,071,** 21,374 ft. divided hy. c. conc., 6 bridges section of Erie Thruway Girard and Fairview Twps., Erie Co. Bids Sept. 27. CD 10/2, under LB.

BUILDINGS—LB & CA

▲ **C. E. Youngdahl & Co., Inc., and Psaty & Fuhrman, Inc.,** 369 Lexington Ave., New York 17, N. Y. CA **$12,715,000.** general constr. and foundations Louis Heaton Pink HOUSES, Proj. NY-5-35 in area bounded by Linden Blvd., Elderts Lane, Stanley Ave. and Crescent St., BROOKLYN, N. Y. New York City Housing Auth., 299 Broadway, New York 7, N. Y. Bids Aug. 27. Grand total $16,194,450. CD 8/29, under LB.
Heating Maintenance Corp., 220 E. 138 St., New York 51, N. Y. CA **$1,259,800.** heating and ventilating work for houses (Brooklyn, N. Y.);
Rao Electrical Equipment Co., Inc., 314 E. 39 St., New York 16, N. Y. CA **$721,000.** electrical work for houses (Brooklyn, N. Y.);
Jarcho Bros., Inc., 38-13 33 St., Long Island City, N. Y. CA **$1,498,650.** plumbing work for houses (Brooklyn, N. Y.).

▲ **E. W. Howell Co.,** 305 Deer Park Ave., Babylon, N. Y., CA **$1,000,000.** 2 story OFFICE, 26-acre tract at Northern State Parkway and Walt Whitman Rd., HUNTINGTON, N. Y. All State Insurance Co., 500 Westchester Ave., White Plains, N. Y. CD 8/20/56.

▲ **Cherrywood-At-Manhasset Hills,** c/o Trylon Realty Co., 98-89 Queens Blvd., Forest Hills, N. Y. Owner Builds. **$1,360,000.** 68 HOMES, Old Courthouse Rd., MANHASSET HILLS, N. Y.

▲ **Beaumont Park,** c/o Albert B. Meklenburg Organization, Inc., 1038 Northern Blvd., Roslyn, N. Y. Owner Builds. **$1,000,000.** 50 HOMES, Park Blvd. near Merrick Rd., MASSAPEQUA PARK, N. Y.

▲ **Leon D. DeMatteis Constr. Co.,** 827 Elmont Rd., Elmont, N. Y. LB **$2,435,827** (16 bidders) general construction LIBRARY, CLASSROOM and ADMINISTRATION BLDG., Hunter College, Bronx Unit, south side of Goulden Ave., 695 ft. south of Bedford Park Blvd., Bronx Boro, NEW YORK, N. Y. Bd. Higher Educ., Hunter College, Business Office, 695 Park Ave., New York 21, N. Y. Bids Oct. 8. CD 8/30;
David Coyne & Co., 250 E. 43 St., New York 17, N. Y. LB **$470,400** (11 bidders) electrical work library, etc. (New York, N. Y.).

▲ **C. E. Youngdahl & Co., Inc., and Psaty & Fuhrman, Inc.,** 369 Lexington Ave., New York 17, N. Y. CA **$5,677,000.** general constr. and foundations for Baruch HOUSES, Proj. NY-5-12, Section III, Bldgs. 12; 13, 14, 15, and 17 in area bounded by E. Houston St., Baruch Dr., Delancey St. and Columbia St., NEW YORK, N. Y. New York City Housing Auth., 299 Broadway, New York 7, N. Y. Bids Aug. 26. CD 8/29, under LB;
Novak & Co., Inc., 1503 East New York Ave., Brooklyn 12, N. Y. CA **$693,237.** plumbing work for Baruch Houses (New York, N. Y.).

▲ **Moriches Oaks,** c/o Stanley H. Klein, archt., 89-31 161 St., Jamaica, N. Y. Owner Builds. **$2,240,000.** 160 HOMES, Jericho Turnpike and Moriches Rd., SMITHTOWN, N. Y.

Jung Bros., Inc., 15 Newark Ave., Maplewood, N. J. LB **$534,400** (44 bidders), general contract, 1 story, 43,000 sq. ft., contemporary design steel aluminum and brick 21 CLASSROOM ADDN. on 28 acre sie on Springfield Ave., CRANFORD, N. J. Union Junior College, Cranford, N. J. CD 10/9/56.

George A. Fuller Constr. Co., 597 Madison Ave., New York 22, N. Y. CA Est. **$500,000.** 4 story NURSES RESIDENCE, NEPTUNE, N. J. Fitkin Memorial Hospital, Corlies Ave., Neptune, N. J. Ferrenz & Taylor, 152 W. 42 St., New York 36, N. Y., archts.

▲† **Allis-Chalmers Mfg. Co.,** 864 S. 7th St., St. Paul 1, Minn. and **Radio Corp. of America,** 30 Rockefeller Plaza, New York 20, N. Y. CA Total Est. **$6,000,000.** design, fabricate Model C STELLERATOR, for thermonuclear research, at James Forrestal Research Center, Project Matterhorn, at Princeton University, PRINCETON, N. J. Atomic Energy Comn., 1901 Constitution Ave. N.W., Wash., D. C. CD 8/28.

▲ **Golf Edge Homes,** c/o Stephen J. Potter, archt., 410 Colonial Ave., Union, N. J. Owner Builds. **$1,750,000.** 50 HOMES in Wychwood Section, WESTFIELD, N. J.

▲ **Wm. F. Lotz, Inc.,** Adams Ave. and Orthodox St., Phila., Pa. CA **$1,000,000.** 1 and 2 story masonry OFFICE and MFG. BLDG., Eastern Montgomery Co., PENNSYLVANIA. Moore Products Co., H and Lycoming Ave., Phila., Pa., I. Rorke, c/o owner, co. engr.

Lansford Corp., 2901 W. Cheltenham Ave., Phila., Pa., Separate Contracts. **$750,000.** RESIDENTIAL DEVELOPMENT, Lansford St., etc., PHILA., PA.

▲ **Coopersmith Bros.,** Phillipsburg, N. J. LB **$1,390,750,** est. $2,183,543. general contract HIGH SCHOOL, parking area, greenhouses, swimming pool, ROYERSFORD, PA. Spring-Ford School Auth., Royersford, Pa. Bids Oct. 1. CD 9/16.

SOUTH

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS

BRIDGES
October 24 Florida

STREETS AND ROADS
October 24 Florida

BUILDINGS—BA

▲ **Ky., Lexington**—MEDICAL SCIENCE—BA 11/15—Commonwealth of Ky., Div. Purchases, Capitol Annex Office Bldg., Frankfort, 7 story, 302,157 sq. ft., brick, stone, rein-con. Medical Science Bldg. to incl. classrooms, auditoriums, library, offices, laboratories, museum, storage rooms, workshops and related facilities, University of Kentucky. $5,200,000. Meriwether, Marye & Assocs., 248 E. Short St., Lexington and Ellerbe & Co., 1st Natl. Bank Bldg., St. Paul, Minn., archts. Extended date. CD 9/26.

HEAVY CONSTRUCTION—LB & CA

▲† **Diamond Constr. Co.,** Ocean Steamship Terminal, Savannah, Ga., CA **$2,184,856,** seaplane vamps, concrete sheet pile bulkheads, aircraft parking apron, grading, storm drainage, HERTFORD, N. C. P. Wks. Office, Fifth Naval Dist., U. S. Naval Base, Norfolk 11, Va. Bids June 27. CD 7/1, under LB.

▲ **Atlantic States Constr. Co.,** 5 Baltimore Place N. W., Atlanta, Ga. LB **$1,249,776,** wharf, transit shed and appurtenances, PORT ROYAL, S. C. S. C. State Forts Auth., 1 Vendue Range, Charleston, S. C. Bids Sept. 24. CD 8/29.

▲ **Bumby & Stimpson, Inc.,** 525 Hames St., Orlando, Fla. CA **$1,431,027** sanitary sewers Contract A, Improvement 1,000, Area "D", FORT LAUDERDALE, FLA. City Comn., Wm. J. Vedder, city mgr., City Hall, Fort Lauderdale, Fla. Bids July 26. CD 9/3, under LB.

Pitt Constr. Co., Inc., 1235 Washington Blvd., Pittsburgh, Pa., CA **$871,300.** 1957 filters addn., water treatment plant (Alex. Orr Jr. Plant) Contr. 140, 6800 Galloway Rd., MIAMI, FLA. Miami Water & Sewer Bd., 3342 Pan American Dr., Miami, Fla. Bids Sept. 19, awarded Oct. 3. CD 9/26, under LB.

F. Miller & Son, Box 921, Lake Charles, La., LB **$729,352** (6 bidders), Kayouche Coulee Pumping Station, CALCASIEU, LA. Gravity Drainage Dist. No. 4, 1 & 2, Lake Charles, La. D. W. Jesson, 909 Ryan St., Lake Charles, La., engr. Bids Oct. 3.

▲ **Flenniken Constr. Co.,** Box 650, Lake Charles, La., CA **$1,965,365** Lake Charles Municipal Airport, FAP No. 9-16-035-701, LAKE CHARLES, LA. Parish Police Jury Airport Dist. No. 1, Court House Bldg., Lake Charles, La. Awarded Oct. 5. CD 8/8.

▲ **KENTUCKY**—State, Dpt. Hys., Frankfort, Ky.,
Ky.-**George H. Cheek Constr. Co.,** McClure Bldg., Frankfort, Ky., CA **$1,456,458.** b. conc. surf. Class I, dense graded aggreg. base 6.051 mi. The Danville-Stanford Road, F 244 (5), SP 69-10 and SP 11-120, Boyle and Lincoln Counties;
Ky.—**Greer Bros. & Young,** London, Ky., CA **$606,813** c. conc. (crushed slag for insulation and entr.), 1.371 The Ashland-Portsmouth (Russelly by-pass) (US 23) Rd., F 201 (11) SP 45-711; SP 45-31, Greenup Co. Bids Sept. 20, CD 9/30, under LB.

BUILDINGS—LB & CA

▲ **John C. Wright,** Arlington Trust Bldg., Arlington, Va., Owner Builds. **$1,000,000.** 200 unit MOTEL, Shirley Hy. and Glebe Rd., ARLINGTON, VA. R. Parli, 2030 16th St., Arlington, Va., archt.

J. B. Denny, Jr., 1238 West 26th St., Norfolk, Va., LB **$403,296** (12 bidders) SUPERMARKET, Campostella Rd., NORFOLK, VA. Giant Open Air Market, 399 Campostella Rd., Norfolk, Va. Bernard B. Spiegel, Kresge Bldg., Norfolk, Va., archts.

▲† **Albert Gersten & Assocs.,** 404 N. Roxbury Dr., Beverley Hills, Calif., LB **$16,586,284,** 1,100 unit ARMED SERVICES HOUSING, NBy-13909, BEAUFORT, S. C. Dist. P. Wks. Office, Bldg. No. 13, U. S. Naval Base, Charleston, S. C. Bids Oct. 4. CD 9/27.

▲ **Fuller & Peacock,** 202-13th St., Augusta, Ga. LB **$1,760,000** Base Bid 1 thru 4 story, 239x349 ft. concrete block HOSPITAL addn., 1621 S. E.

3 Ave., FORT LAUDERDALE, FLA. North Broward General Hospital, Dist. Comn. of Broward Co., Courthouse, Fort Lauderdale, Fla. Bids Oct. 2. CD 9/13.

S. W. Raulson, 5360 Palm Ave., Hialeah, Fla., LB **$420,000.** 42 RESIDENCES, W. 53 St. and W. 43 Terrace area, Palm Springs Development Addn., HIALEAH, FLA. Fort Constr. Co., 5360 Palm Ave., Hialeah, Fla. R. J. Schneider, 1431 Flamingo Way, Hialeah, Fla., archt.

Clutter Constr. Corp., 377 Westward Dr., Miami Springs, Fla., CA **$825,000.** 150-unit, MOTOR LODGE, 16500 N.W. 2 Ave., MIAMI, FLA. L. & S. Enterprises, Inc., 355 Lincoln Rd., Miami Beach, Fla. Emory L. Jackson, 42 N.E. 54 St., Miami, Fla., archt. Jules P. Channing Assocs., 71 N.W. 54 St., Miami, Fla., engrs.

▲ **Robert L. Turchin, Inc.**, 1835 Purdy Ave., Miami Beach, Fla. CA **$1,500,000**, 132 room addn. to Castaway MOTEL, 163 St. and Collins Ave., MIAMI BEACH, FLA. Castaway Motel Corp., Mr. J. Hart, mgr., 163 Collins Ave., Miami Beach, Fla.

▲† **Jordan Co.**, Andrews Rd., Columbus, Ga., LB **$3,520,400** (3 bidders) Phase II, 200 brick veneer Capehart HOUSING, incl. on site work, FORT MCCLELLAN ALA. Dpt. Army, Fort McClellan, Anniston, Ala. Bids Oct. 3. CD 9/20.

Wm. S. James, Jr., Box 1351, Texarkana, Ark., LB **$548,055** (6 bidders) HOUSING, Proj. LA-43-1, incl. 15 dwellings containing 30 units and 1 office maintenance bldg., DONALDSONVILLE, LA. Housing Authority of City of Donaldsonville, Donaldsonville, La. Bids Oct. 3. CD 9/11.

Madden Co., Inc., Bossier City, La., LB **$676,666** (5 bidders) 30-classroom ELEMENTARY SCHOOL, LEESVILLE, LA. Vernon Parish School Bd., Leesville, La. Bids Oct. 3. CD 9/11.

Union Constr. Co., Inc., Box 8335, New Orleans, La., LB **$441,471**, 2 story, concrete, brick ELEMENTARY SCHOOL, NEW ORLEANS, LA. St. Raymond Roman Catholic Church, 3728 Parish Ave., New Orleans, La. Bids Oct. 3. CD 9/30.

▲ **Kemmons Wilson**, 4985 Summer Ave., Memphis, Tenn. CA **$1,601,000**, 11 story APARTMENT, MEMPHIS, TENN. University Towers, Inc., c/o contractors, William W. Bond, Jr. & Louis G. Ost, Jr., 4985 Summer Ave., Memphis, Tenn., archts. CD 4/2/56.

MIDDLE WEST

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS
BRIDGES
October 23 Michigan October 29 Indiana
STREETS AND ROADS
October 23 Michigan October 29 Indiana

BUILDINGS—BA

Ill., **Chicago**—CHURCH—BA 10/22—Parish of St. Pancratius, 4025 S. Sacramento Ave., church, 40th Place and Sacramento. $600,000. Thos. Higgins Assocs., 228 N. LaSalle St., archts. CD 6/10.

▲ O., **Steubenville**—HOUSING—BA 10/31—Steubenville Metropolitan Housing Auth., 604 Sinclair Bank Bldg., low rent housing, Proj. OH 14-1. $1,800,000. Plans deposit $50. John J. Rietz, 210 N. 6th St., archt. CD 10/3/56.

HEAVY CONSTRUCTION—LB & CA

▲† **The Great Lakes Dredge & Dock Co.**, Williamson Bldg., Cleveland 14, O., LB **$1,538,350**, maintenance dredging in Cuyahoga River, Cleveland, OHIO, U. S. Eng., Engineers Park, Buffalo, N. Y. Awarded Sept. 30. CD 9/26, under LB.

▲ **John Dehner, Inc.**, 1206 Clark St., Fort Wayne, Ind., LB **$1,600,254** (only bidder) 3 sections sewerage system, HUNTINGTON, IND. City, City Hall, Huntington, Ind. CD 12/10.

E. A. Bock Constr. Co., 1120 Sinclair St., Fort Wayne, Ind., LB **$394,700** (5 bidders) one of 3 sections renovating city sewage treatment plant (Huntington, Ind.).

C. & C. Constr. Co., Inc., 2001 E. Pontiac St., Fort Wayne, Ind., LB **$394,700** (5 bidders) identical bid as above for one of three sections renovating city sewage treatment plant (Huntington, Ind.).

▲ **ILLINOIS**—Dpt. P. Wks. & Bldgs., Div. Hys., Centennial Bldg., Springfield, Bids opened Oct. 8,

Ill.—**Fruin-Colnon Co.**, 1706 Olive St., St. Louis, Mo. and **H. H. Hall Co.**, 200 St. Clair Ave., East St. Louis, Ill., LB **$2,623,682** (1 bidder), 19 span railroad grade separation structure on FAI-7, E. St. Louis, St. Clair Co. CD 9/30.

Ill.—**Merritt-Chapman Scott**, Commercial Natl. Bank Bldg., Peoria, Ill., LB **$250,875** (2 bidders), cantilever deck truss grade separation on FAI-5 in East Peoria, Tazewell Co.;

Ill.—**Hansel-Elcock Co.**, 485 W. 23 Place, Chicago, Ill., LB **$251,798** (6 bidders), furnish steel for 3 grade separations on NW Expressway in Chicago, Cook Co.;

Ill.—**R. R. Anderson Co.**, 4550 W. Paterson St., Chicago, Ill., LB **$1,181,959** (2 bidders), 3 span and 2 span grade separation on Harlem Ave. inter Congress Express, Cook Co.;

Ill.—**Industrial Constr. Co.**, 20 N. Wacker Dr., Chicago, Ill., LB **$553,927** (3 bidders), 13 span steel plate girder bridge on FA 178 at Peru, LaSalle Co.

▲ **ILLINOIS**—Illinois State Toll Hy. Comn., 20 N. Wacker Dr., Chicago,

Ill.—**Sjostrom & Sons, Inc.**, 1718 7 Ave., Rockford, Ill., CA **$2,081,461**, Contr. TP-1 11 toll plazas, etc., 9 on North Illinois Tollway and 2 on Tri-State Tollway, Cook, Kane, Lake and Winnebago Counties;

Ill.—**Standard Paving Co.**, 30 N. LaSalle St., Chicago, Ill., **Peter J. Crowley Co.**, Box 144, Maywood, Ill. and **A. L. Jackson Co.**, 300 W. Washington St., Chicago, Ill., CA **$2,955,002**, Contr. TP-2, 11 toll plazas, etc. 7 on Tri-State Tollway, 1 on North Illinois Tollway and 3 on East-West Tollway, Cook and DuPage Counties. Bids Sept. 26, awarded Oct. 4. CD 10/3, under LB.

Lee Constr. Co., 127 N. Dearborn St., Chicago, Ill., LB **$418,240**, 1 story, brick, field house for Avalon Park, CHICAGO, ILL. Chicago Park Dist., 425 E. 14 Blvd., Chicago, Ill. Bids Oct. 2. CD 9/10.

MICHIGAN—State Hy. Comn., Stevens T. Mason Bldg., Lansing,

Mich.—**Hodgkiss & Douma**, Petoskey, Mich., LB **$353,910, est. $430,000 (13 bidders) bit. aggreg.**, b. conc. some base course wid'n. 12.595 mi. in and out of Rogers City, F 71091 C1-U (F 4 5) M 71091 C3-U M 71091 C4-R, M 71091 C2-U F 71021 C2-U (F 4 5) F 71021 C3-U. (F 4 4) F 71021 C4-R (F 4 4) M 71072 C1-U M 71073 C2-U, Presque Isle Co.;

Mich.—**Ayling Asphalt & Paving Co.**, Adrian, Mich., LB **$140,183**, est. $170,000 (8 bidders) b. conc. wearing surf. course 4.74 mi. M-50 from 1.7 mi. west of Tipton east, M 46081 C1-R, Lenawee Co.;

Mich.—**Cadillac Asphalt Paving Co.**, 12490 Evergreen St., Detroit, Mich., LB **$209,597**, est. $220,000. (6 bidders) removing asph. surf. (planer method) and b. conc. surf. course 2.111 mi. US 112 from Greenfield Ave. to Wyoming Ave., Dearborn, M 82062 C2-U Wayne Co. Bids Oct. 2. CD 9/26.

BUILDINGS—LB & CA

▲ **Murphy Bldrs., Inc.**, 7945 Hamilton, Cincinnati, O., Own Forces, **$1,725,000**, 90 split-level, 1 story, partial bsmnt. HOMES on Eldora Dr. extension, CINCINNATI, O. CD 8/15.

▲ **Carl M. Geupel Constr. Co.**, 1919 N. Meridian St., Indianapolis, Ind., CA Est. **$4,000,000.** edible soybean protein mfg. FACTORY, near W. 18 St. and Montcalm, INDIANAPOLIS, IND. Glidden Co., Union Commerce Bldg., Cleveland, O. CD 10/8.

▲ **J. L. Simmons Co.**, 427 E. Monroe St., Springfield, Ill., CA **$1,316,000.** general contract HOME ECONOMICS BLDG., Southern Illinois University, CARBONDVALE, ILL. Dpt. Educ., Springfield, Ill. Awarded Oct. 3. CD 6/10.

▲ **Geo. A. Fuller Co.**, 111 W. Washington St., Chicago, Ill. CA **$10,000,000**, 250,000 sq. ft. BANK addn., bounded by LaSalle, Jackson, Wells and Quincy Sts., CHICAGO, ILL. Federal Reserve Bank of Chicago, LaSalle St. and Jackson Blvd., Chicago, Ill. Bids Sept. 24. CD 4/1.

▲ **Walter J. Olson & Co.**, 7912 S. Halstead St., Chicago, Ill. CA **$2,000,000**, FACTORY and WAREHOUSE addn., and bit paving, 2019 N. Oak Park Ave., CHICAGO, ILL. Mars Inc., 2019 N. Oak Park Ave., Chicago, Ill. Bids Aug. 27. CD 8/19.

Coath & Goss, Inc., 5103 W. Lake St., Chicago, Ill. LB **$856,191**, 2 story, brick Lincoln SCHOOL and GYMNASIUM, 835 Harvard Ave.; 2 story, brick Hatch ELEMENTARY SCHOOL and GYMNASIUM addn., 1000 N. Ridgeland Ave., OAK PARK, ILL. Oak Park School Dist. 97, 122 Forest Ave., Oak Park, Ill. Bids Oct. 1. CD 8/30.

▲ **Alstrom Constr. Co.**, 1021 E. Airport Rd., Muskegon, Mich., LB **$1,939,500.** Steele JUNIOR HIGH SCHOOL, MUSKEGON, MICH. City, Public Schools, Frank Deyos, secy., Muskegon, Mich. Bids Oct. 1. CD 8/30.

WEST OF MISSISSIPPI

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS
BRIDGES
October 25 Kansas, Minnesota
STREETS AND ROADS
October 25 Kansas, Minnesota

▲† **Kansas**—BA 10/22—U. S. Eng., Federal Office Bldg., Kansas City, Mo., permanent office bldg., Tuttle Creek Dam and Reservoir Proj., Manhattan, Inv. 23-028-58-27. CD 9/5.

BUILDINGS—BA

▲ **Tex., Fort Worth**—EDISON BLDG.—BA 10/24—Southwestern Bell Telephone Co., 308 Akard St., Dallas, 9 story masonry, fireproof, Edison Bldg. on Houston between 10 and 11 Sts. $5,700,000. Plans deposit $50. Hedrick & Stanley, 1200 T&P Bldg., archts. CD 9/9.

▲† **Okla., Oklahoma City**—HOUSING—BA 10/30—Div. Procurement, Tinker Air Force Base, 268-unit Capehart Housing at Tinker Field, $2,500,000. Plans deposit $100. Hudgins Thompson & Ball, 1411 Classen, Oklahoma City, archts. CD 3/12/57.

▲ **Tex., Odessa**—HOSPITAL—BA 10/31—Medical Center Hospital, Ector County, c/o Comrs. Court, Odessa, hospital medical center addns. $2,000,000. L. F. Crockett & Assocs., 506 N. Lincoln St., archts.-engrs. CD 3/15.

▲ **Minn., Minneapolis**—BANK-OFFICE—BA 11/6—Holabird & Root & Burgee, archts., c/o First National Bank (Owner), attention Alan Moore, 5 St. and Marquette Ave., Minneapolis, Minn., general contract to cover all work, 5 story, bsmnt., sub-bsmnt., 198 x 214 ft., 400,000 sq. ft. bank-office bldg. between Marquette and 2 Aves. South and between 5 and 6 Sts. $14,000,000. Thorshov & Cerny, Inc., 400 Metropolitan Bldg., Minneapolis, and Holabird & Root & Burgee, 180 N. Wabash St., Chicago, Ill., archts. CD 3/11.

▲† **Colo., Denver**—POSTAL ANNEX—BA 11/8—General Services Admin., 19th and F Sts. N.W., Wash., D. C., 4 story, 528,000 sq. ft. postal annex with 6 story office tower. $8,209,000. Extended date. T. F. Buell & Co., 730 14th St., archts.-engrs. CD 7/18.

BUILDINGS—SLC

MO., St. Louis — DORMITORY — Maryville College of Sacred Heart, 2900 Meramec St., Zone 18, soon let contract 4 story ground floor, brick, cut stone blocks, concrete, steel dormitory for 200 girls on college campus, Proj. Mo. 23-CH-37(D). Over $500,000. Raymond E. Maritz & Sons, 721 Olive St., Zone 1, archts. CD 8/13.

▲ **Tex., Edinburg**—HOTEL-MOTEL—Edinburg Community Hotel Corp., c/o Joe Davis, pres., Edinburg, soon lets contract luxury hotel-motel $1,000,000. J. N. McCammon, Meadows Bldg., Dallas, Tex., and Carlos B. Schoeppl, 2701 Biscaine Blvd., Miami, Fla., engrs. CD 8/15/56.

HEAVY CONSTRUCTION—LB & CA

† **Sweetman Constr. Co.**, 100 S. Dakota St., Sioux Falls, S. D. LB **$238,025** (6 bidders) levee repairs Skunk Creek, Big Sioux River, Sioux Falls, Bonus Co., Inv. 25-066-58-36. SOUTH DAKOTA. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids Oct. 4. CD 9/25.

Hobe Eng. Co., 2121 4th St., Sioux City, Iowa. LB **$211,951**, est. $186,346 bridge over Nemaha River, FALLS CITY, NEB. Richardson Co., Falls City, Neb. Bids Oct. 3. CD 10/3, under LB.

† **Neosho Constructors**, Emporia, Kan. LB **$492,680** relocating Greenwood County roads, Toronto Dam Proj. at Verdigris River, near Toronto, Inv. 34-066-58-2, KANSAS. U. S. Eng., Box 61, Tulsa, Okla. Bids Sept. 19. CD 8/29.

Brown Bros. Constr. Co., 2408 Steele Rd., Kansas City, Kan. LB **$223,568**, sewers in Dist. 34A, KANSAS CITY, KAN. City, City Hall, 805 N. 6 St., Kansas City, Kan. Haskins, Riddle & Sharp, Finance Bldg., Kansas City, Mo., engrs. CD 11/8/54.

Missouri-Kansas-Texas Ry. Co., T. S. Carter, chf. engr., St. Louis, Mo. and Denison, Tex., Purchase and Hire: **$125,000** diesel fuel steel storage tank, DENISON, TEX. CD 5/10.

▲ **R. P. Farnsworth & Co.**, Salcedo St., New Orleans, La. CA **$2,168,211.** Wharves No. 18 and 19, HOUSTON, TEX. Port Comn., c/o Houston-Harris Ship Channel Navigation Dist., 1519 Capitol St., Houston, Tex. Bids Sept. 18. CD 8/20.

▲ **R. P. Farnsworth & Co.**, Salcedo Dr., New Orleans, La. CA **$1,139,655.** Unit No. 1 Open Wharf No. 20, HOUSTON, TEX. Port Comn., c/o Houston-Harris Ship Channel Navigation Dist., 1519 Capitol St., Houston, Tex. Bids Sept. 18. CD 9/26, under LB;
Metallic Bldg. Co., 4601 Holmes St., Houston, Tex. CA **$600,000.** Transit Sheds No. 1 and 2 on Wharves 18 and 19 (Houston, Tex.)

▲ **COLORADO**—State Hy. Dpt., 4201 E. Arkansas St., Denver,

Z. H. Lowdermilk, Inc., Englewood, Colo., CA **$1,571,002**, grading, structures 2.801 mi. Idaho Springs, Colo., Proj. F 005-3 (11) Clear Creek Co. Bids Oct. 8. CD 10/3.

BUILDINGS—LB & CA

▲ **National Lead Co.**, Titanium Div., 722 Chestnut St., St. Louis, Zone 1, Separate Contracts, **$1,072,000.** PLANT addns., imprvs. adjacent to confluence of Mississippi River and River des Peres, incl. calcination, milling, digeter, clarification, acid and power bldgs., HANCOCK (St. Louis 23, P. O.), MO.

Harry W. Hennies, c/o Bunker Hill Lumber & Bldg. Co., c/o Bunker Hill, Houston, Tex. Owner Builds. **$875,000**, SHOPPING CENTER about 9700 blk. of Katy Utilities Rd., HOUSTON, TEX. CD 10/10.

Pinehurst Corp., c/o 6332 Long Dr., Houston, Tex. Owner Builds. **$359,750**, 30 DWELLINGS; **$346,000**, 27 DWELLINGS in Crestmont Subdivision, HOUSTON, TEX. CD 8/30.

▲† **C. S. Logeman**, Box 2255, San Antonio, Tex., LB **$1,309,482** (14 bidders) altering bldgs. and utilities Veterans Administration HOSPITAL, MCKINNEY, TEX. Veterans Admin., Munitions Bldg., Wash., D. C. Bids Oct. 8. CD 8/30.

▲ **Walsh & Burney Co.**, Box 5176, Beacon Hill Station, San Antonio, Tex., CA **$1,349,900** Base Contract, CHILDREN'S HOSPITAL and OUT PATIENT CLINIC, SAN ANTONIO, TEX. Santa Rosa Children's Hospital Foundation, W. Houston and Santa Rosa Sts., San Antonio, Tex. Bids Sept. 26. CD 10/8, under LB.

▲ **Western Knapp Co.**, 760 Folsom St., San Francisco, Calif., CA **$2,500,000**, constr. 250 ton per day URANIUM PROCESSING MILL, BEDROCK, COLO. Atomic Fuel Extraction Co. and Nuclear Resources, Inc., 230 Pitkin St., Grand Junction, Colo.

▲ **Mead & Mount Constr. Co.**, 1560 Denver Club Bldg., Denver, Colo., LB **$3,262,000.** 7 story, 2 bsmnt., 160,000 sq. ft., steel frame STATE SERVICE OFFICE

Continued on page 378

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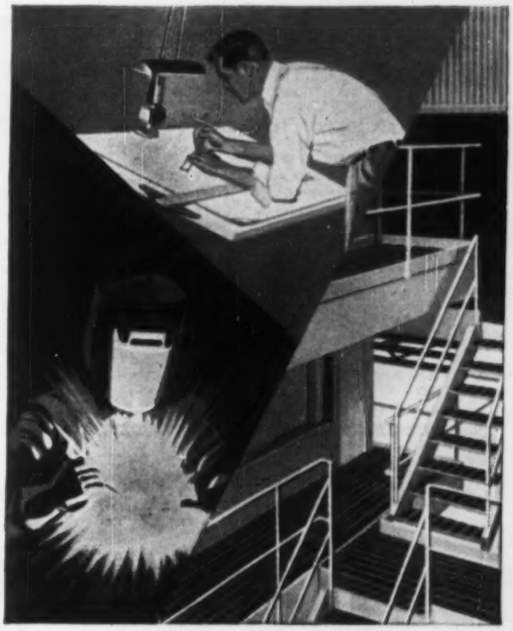

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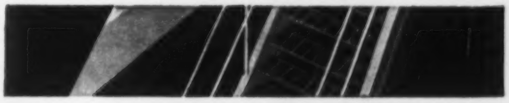

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Continued from page 376

BLDG., DENVER, COLO. State of Colorado, State Office Bldg., 1422 Grant St., Denver, Colo. Bids Sept. 27. CD 8/26.

FAR WEST

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS

BRIDGES

October 23, 30 California

STREETS AND ROADS

October 30, November 7 California

▲ **Wash., Hoquiam**—BA 10/28—City, City Hall, 8 rein.-con. pumping stations on piling fdns.; 104,600 ft. 6- to 42-in. concrete corrugated metal and steel storm drains; 4,100 ft. 8- to 18-in. gravity-flow sanitary sewers; 24,900 ft. 6- to 24-in. concrete asbestos-cement or concrete cylinder pipe sanitary pressure sewers, $1,500,000. Plans deposit $80. C. E. Green & Assocs., Henry Bldg., Portland, Ore., engrs. CD 5/31.

BUILDINGS—BA

▲ **Calif., Oakland**—SCHOOL—BA 11/12—Oakland Unified School Dist., 1025-2nd Ave., wood frame, rein.-con. Joaquin Miller Junior High School. $1,538,800. Plans deposit $50. Reynolds & Chamberlin, 3833 Piedmont Ave., archts. CD 10/17/56.

BUILDINGS—SLC

▲ **Calif., Sunnyvale**—PLANT—Belfast Beverages, 960 Kifer Rd., soon lets contract 200x135 ft. bottling plant, $1,000,000. John G. Minton, 1045 Sansome St., San Francisco, archt. B. L. Niskian, 1045 Sansome St., San Francisco, engr.

HEAVY CONSTRUCTION—LB & CA

▲ **WASHINGTON**—State Hy. Comn., W. A. Bugge, dir. Hys., Dpt. Hys., Olympia,

Osberg Constr. Co., 1132 N. 128 St., Seattle 33, Wash., CA **$1,089,713** (7 bidders) grading, draining, constr. rein.-con. slab bridge on 2.114 mi. Primary State Hy. 1, Fielding to North Sts., in Bellingham, as part of freeway, FAP. No. 1-001-5(23) Whatcom Co. Bids Oct. 1, awarded Oct. 3. CD 10/3, under LB.

▲† **U. S. Eng.**, 1209 8th St., Sacramento, Calif., rejected bids May 24 (lack of authorization) main dam, building, and appurtenances for Success Dam, Tule River, ENG-04-167-57-83, CALIFORNIA. LB **$6,539,934. CD 5/28, under LB.**

▲† **K. L. Goulter & Son**, 3419 16 Ave. W., Seattle, Wash., CA **$1,509,290**, relocating Forest Service West Side Rd., dam to Packard Creek, Hills Creek Reservoir, CIVENG-35-026-58-18, OREGON, U. S. Eng., Pittock Block, Portland, Ore. Bids Sept. 17. CD 9/24, under LB.

BUILDINGS—LB & CA

▲† **Bureau Reclamation**, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., rejected bids Sept. 12, one hundred 3 bedroom RESIDENCES near Lees Ferry, one hundred 3 bedroom RESIDENCES for Colorado Storage, DC 4945, Page, ARIZONA. LB Est. Sch. 1 **$1,366,750**; Sch. 2 **$1,158,250**. CD 9/24, under LB.

▲ **Carter Mack Builders**, P. O. Box 457, Harbor City, Calif., CA **$1,051,795** Peary JUNIOR HIGH SCHOOL, Gardena, LOS ANGELES, CALIF. Los Angeles Bd. Educ., 1425 S. San Pedro St., Los Angeles, Calif. Bids Sept. 24. CD 9/30, under LB.

CANADA

HEAVY CONSTRUCTION—BA

STATE HIGHWAY LETTINGS

STREETS AND ROADS

October 23 Ontario

HEAVY CONSTRUCTION—LB & CA

▲ **NEWFOUNDLAND**—Dpt. P. Wks., Hunter Bldg., Ottawa, Ont.,

Concrete Products (NFLD) Ltd., Mt. Pearl St., St. John's, Newfoundland, CA **$1,635,250**, grading, culverts, traffic grav., about Mile 0 to Mile 11, Trans-Canada Hy., Terra Nova National Park, Charlottetown. Bids July 1, awarded Oct. 2. CD 7/18, under LB.

▲ **George Gagne Ltee.**, 190 Blvd. Crèmazie E., Montreal, Que., CA approx. **$1,500,000**. bridge over Riviere Jacques Cartier, Montreal-Quebec Hy. to replace old wooden structure with new approaches, etc. Provincial P. Wks. Dpt., Quebec City, Que. Olivier Desjardins, c/o owner, ch. engr. Awarded Oct. 1.

Dual Mixed Concrete Ltd., 3701 Cote St. Michel Rd., Montreal, Que., CA **$933,463**, parkway over Mount Royal from Cote des Neiges Rd. to Blvd. Mount Royal, two 24 ft. roadways with 10 ft. embankment on Remembrance Rd. to Mount Royal Blvd., MONTREAL, QUE. City, City Hall, Monteral, Que. Lalonde, Girouard & Letendre, 8790 Park Ave., Montreal, Que., engrs. Bids Sept. 18, awarded Oct. 3. CD 9/26, under LB.

BUILDINGS—LB & CA

▲ **Claydon Co., Ltd.**, 290 Gary St., Winnipeg, Man., CA **$1,250,000** (8 bidders) 5 story, 45x100 ft. HOSPITAL addn., WINNIPEG, MAN. Salvation Army, 20 Albert St., Toronto, Ont. Bids July 23, awarded Oct. 1. CD 7/29.

▲ **Foundation Co. of Canada, Ltd.**, 1220 Bay St., Toronto, Ont., CA Approx. **$1,250,000** (6 bidders) 12 story, 43x90 ft., steel, frame, masonry walls, steel deck floors, OFFICE MLDG., concrete fdn., 366 Bay St., TORONTO, ONT. 366 Bay St., Ltd., c/o Guaranty Trust Co. of Canada, 70 Richmond St. W., Toronto, Ont. Bids Aug. 21, awarded Sept. 27. CD 8/13.

LATIN AMERICA

HEAVY CONSTRUCTION—BA

▲ **Argentina**—BA 1/10—Ministerio de Obras Publicas, Avenida 9 de Julio No. 1925, Buenos Aires, study, planning, construction financing, exploiting and maintenance of tunnel under Parana River to join cities of Santa Fe and Parana.

AMERICANS ABROAD

HEAVY CONSTRUCTION—LB & CA

▲ **Development & Resources Corp.**, 50 Broadway, New York, N. Y., U.S.A., CA Est. **$32,000,000**. access projects for Diz Dam, polyvinyl chloride plant at Ahwaz, gas pipeline from Agha Jari to Ahwaz; power transmission line from Abadan to Ahwaz; sugar cane mill and refinery, IRAN, Iranian Plan Organization Govt. Iran, Tehran, Iran. CD 3/30/56.

BUILDINGS—LB & CA

▲ **Loewy-Hydropress Div., Baldwin-Lima-Hamilton Corp.**, 111 5th Ave., New York 3, N. Y., U.S.A., CA Total est. **$12,500,000**. design, construct and equip. structural steel MILL and hot and cold SHEET MILL at Iligan City, Mindanao, PHILIPPINE ISLANDS. National Shipyards & Steel Corp., Manila, Philippine Islands.

FOREIGN

HEAVY CONSTRUCTION—BA

▲ **Jordan and Saudi Arabia**—RAILROAD—BA 1/30—Hedjaz Railway Line, Executive Committee, Damascus, Syria, construct and finance 844 kilometers section of Hedjaz Railway from Ma'an to Jordan to Median in Saudi Arabia. Total cost $25,000,000. Brown & Blauvelt, 468 Madison Ave., New York 16, N. Y., U. S. A., engrs. CD 10/11/56.

BUILDINGS—LB & CA

▲ **Societe Ensa, St. Gobain, Societe Chimique de la grade Paroisse, Societe Potasse et Engrais Chimiques**, Paris, France, CA Est. **$32,000,000**. 200 tons per day ammonia fertilizer PLANT at Multan, PAKISTAN. Pakistan Industrial Development Corp., Karachi, Pakistan.

(Proposal Advertisement see pp. 392 to 394)

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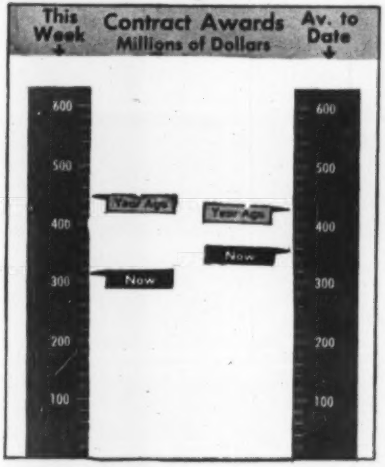
Construction Scoreboard

Activity this Week



AMOUNT OF CONTRACTS LET

By Ownership	This Week (millions)	Cum. 42 wks 1957 (millions)	Chge '56-'57 %
Federal	$22.7	$1,987.3	+40
State and Municipal	159.3	6,096.0	+14
Total Public	182.0	8,083.3	+19
Total Private	130.3	6,973.4	−37
U. S. Total	$312.3	$15,056.7	−16

By Type of Work			
Waterworks	$16.4	$292.3	−1
Sewerage	8.0	453.3	−8
Bridges	19.3	590.9	+16
Highways	44.8	2,505.8	+24
Earthwork, Waterways	7.5	871.4	+39
Buildings:			
Public, Excl. Housg.	43.5	1,894.3	+13
Public Housing	25.8	571.5	+103
Private Housing	67.1	2,499.6	−45
Commercial	28.6	1,413.0	−9
Industrial	30.2	2,664.2	−39
Unclassified	21.1	1,300.4	−13
U. S. Total	$312.3	$15,056.7	−16

NOTE: Minimum size projects included are: Waterworks and waterways, $44,000; other public works, $73,000; industrial buildings, $93,000; other buildings, $344,000.

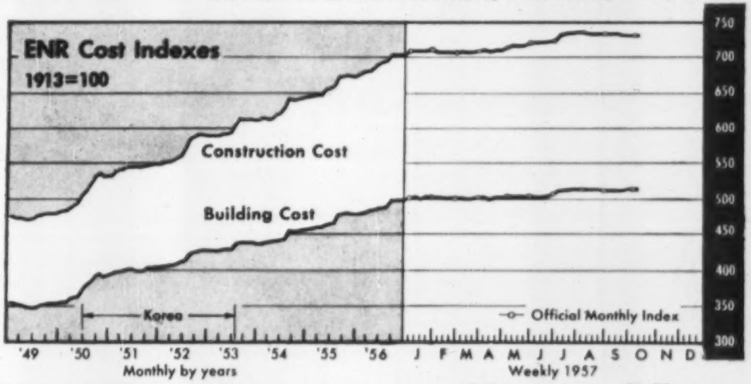
NEW CAPITAL FOR CONSTRUCTION

	Week of Oct. 10 (millions)	Cum. 41 wks 1957 (millions)	Chge '56-'57 %
Corporate Securities	$254.9	$4,671.1	+18
State and Municipal:			
All Except Housing	90.8	4,323.4	+20
Housing	...	155.8	+268
Federal Loans	...	171.7	+29
Federal Aid	...	2,161.2	+102
Total Nonfederal	$345.7	$11,483.2	+31
Federal Appropriations:			
In U. S.	...	$2,777.0	−20
Outside U. S.	...	29.0	+82
Total New Capital	$345.7	$14,289.2	+16

Cost Indexes as of Now

ENR INDEXES (1913=100), 20-cities' average	Week of Oct. 10 1957	% Change from Sept. 12 1957	% Change from Oct. 11 1956
Construction Cost	736.92	−0.1	+4.6
Building Cost	516.56	+0.1	+3.3

To convert above indexes to 1926=100: Divide Construction Cost by 2.080; Building Cost by 1.850
1949=100: Divide Construction Cost by 4.770; Building Cost by 3.518



CONTRACTS AWARDED

	1957 Sept. (millions)	1957 9-Mos. (millions)	% Change from 1956 Sept.	% Change from 1956 9-Mos.
Total U. S., ENR reported	$1,247.1	$14,087.2	−16	−15
Private	644.0	6,544.3	−28	−37
Public	603.1	7,542.9	+ 3	+22
State and Municipal	526.6	5,646.9	+16	+16
Federal	76.5	1,896.0	−44	+44
ENR Volume Index, 1913=100	466	543	−22	−21

NEW CONSTRUCTION CAPITAL

Total U. S	$981.6	$13,820.1	+ 4	+16
State and Municipal Bond Sales	450.6	4,303.7	+45	+25
Corporate Security Sales	467.4	4,377.5	−26	+16
Federal Loans, Aid (nonfederal work)	8.0	2,332.9	....	+95
Federal Appropriations (federal work)	55.6	2,806.0*	....	−19

* Includes funds for outside U. S.

MATERIALS SHIPMENTS

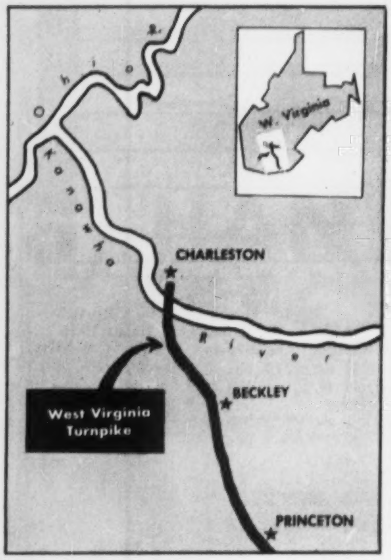
	Unit	1957 June (J) July (Jl) Aug. (Ag) Sept. (S)	Cum. (No. of Mos.)	Percent Change from Year Ago Mo.	Percent Change from Year Ago Cum.
Portland Cement, Bur Mines	thous bbls	25,625(Jl)	154,724(7)	−18	−11
Concrete Paving Awards, PCA	thous sq yd	5,292(Ag)	66,835(8)	−37	+11
Fabricated Structural Steel	thous tons	333(Ag)	2,455(8)	+56	+17
Bookings, AISC	thous tons	167(Ag)	2,094(8)	−38	−24
Reinforcing Bars, Net, AISI	thous tons	172(Jl)	1,508(7)	n.a.	n.a.
Lumber, NLMA	mil fbm	3,147(Ag)	22,951(8)	− 4	− 9
Orders	mil fbm	2,967(Ag)	22,977(8)	− 5	− 7
Production	mil fbm	3,107(Ag)	22,880(8)	−12	−10
Douglas Fir Plywood, DFPA, ⅜" basis					
Production (aver per week)	mil sq ft	106.5(Ag)	102.6(8)	+ 3	+ 1
Orders (average per week)	mil sq ft	108.6(Ag)	102.3(8)	+ 6	+11
Clay Products, Bureau of Census					
Brick, Ungl, Common, Face	mil bri	542.0(J)	2,790.2(6)	−14	−17
Vitrified Clay Sewer Pipe	thous tons	153.6(J)	797.8(6)	−16	−10
Structural Tile, Unglazed	thous tons	54.2(J)	296.0(6)	− 9	−13
Asphalt Products, Bureau of Census					
Asphalt Roofing	thous sales sqs	5,433(Jl)	29,818(7)	− 4	−12
Asphalt Siding	thous sales sqs	81(Jl)	570(7)	−18	−11
Aluminum, Wrought, Net, Bur Census					
Sheet and Plate (non-heat treatable)	mil lbs	93.2(Jl)	580.7(7)	− 1	−15
Wire and Cable	mil lbs	25.5(Jl)	167.5(7)	+11	− 8
Extruded Shapes (soft alloys)	mil lbs	59.6(Jl)	371.2(7)	+11	− 3

EMPLOYMENT AND FAILURES

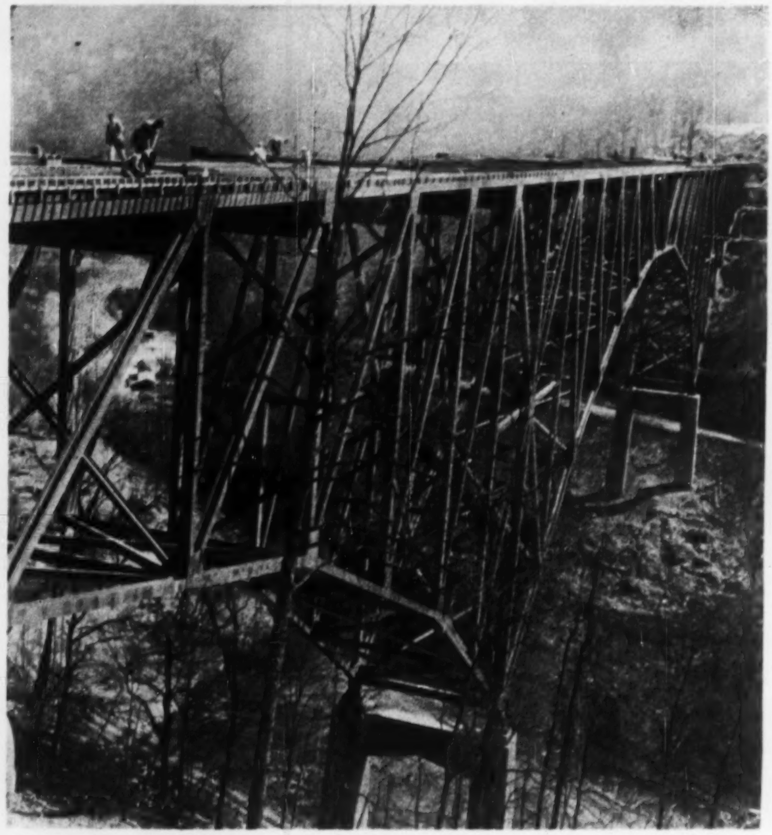
Contract Const Employment, BLS	thous	3,299(Ag)	2,988(8)**	− 2	+ 3
Contractor Failures, Dun & Bradstreet					
Number		164(S)	1,562(9)	+12	+20
Liabilities	thous	$5,618(S)	$83,185(9)	−28	+18

**Average per month

West Virginia's Turnpike has been the state's major headache and the bondholders' heartache because it fails to attract sufficient traffic



THE TURNPIKE leads to nowhere.



DIFFICULT CONSTRUCTION jobs such as this bridge were many and costly.

A Toll Highway Heads Toward Default

The West Virginia Turnpike, which snakes its way across some of the nation's most rugged mountain terrain, is well on its way to becoming one of the country's most magnificent financial flops.

And unless last-minute rescue steps are taken, investors—and some speculators—will be left holding a bag containing $133 million in bonds that financed the facility. These bondholders are all hoping that the state's legislature, to convene in January, will act to prevent default in June 1958 when $2.6 million in interest on the debt falls due.

According to some financial authorities, the default would be the largest of its type witnessed by the nation. The magnitude of the impending failure therefore has stimulated the imagination of engineering and financial groups and all types of suggestions are being supplied to state officials.

W. Earnest Stahl, general manager and comptroller of the West Virginia Turnpike Commission, recently informed ENR that "at the present time we are unable to definitely state what steps will be taken by the state legisture in an effort to prevent the default on June 1, 1958."

Gov. Chester Underwood hopes that a long-range solution will be provided in the form of a Great Lakes-to-Florida highway. Construction of such a road would remove the turnpike from its present nowhere-to-nowhere status. However, it obviously won't put money in the till by June 1.

Just last week Governor Underwood and Gov. C. William O'Neill met with Bertram D. Tallamy, Bureau of Public Roads director, to sell him on the idea of building a federal-aid road from Canton, Ohio to Charleston. If included in the 1,000 mi of the interstate highway net still to be allotted, U. S. Route 21 would be brought into the picture and its 80 mi portion within West Virginia would be brought up to interstate standards from Charleston to Parkersburg.

The total distance of 190 mi from Charleston to Canton, Ohio, via U. S. Route 21 would be constructed and rebuilt on a 90-10 federal-state matching basis. The only hitch in such a proposal is the fact that total requests from states for the available 1,000 mi of the interstate net actually add up to 13,000 mi (ENR July 25, p. 26). Governor Underwood and Governor O'Neill both appear to be playing with long odds.

There is little doubt, however, that were U. S. Route 21 to be included in the interstate system, the turnpike would pay its way in a hurry, because it would be an important existing link in the projected Great Lakes-Florida highway.

• The weaknesses—Governor Underwood's latest request, one of many to Washington highway officials, congress-men and senators, actually points to the crux of the West Virginia Turnpike troubles—its sorry routing.

Starting at Charleston, the turnpike is some 200 mi south of the Pennsylvania-Ohio Turnpike and roughly the same distance from the state's populous centers of Wheeling and Weirton. And in ending at Princeton, it fades at a point of no great interest to much of the motoring public or commercial vehicles. Princeton is a quiet little town of only 5,000 population. The road does not even supply a complete link with Virginia, for it is a dozen miles short of the West Virginia-Virginia border.

Another major weakness is that it is but a two lane facility. This fact has discouraged other states from considering possible joinings with the turnpike. In addition, truckers are not enthusiastic about the road because of the single lane traffic in each direction. Even though the road does traverse some of the most difficult mountain territory in the United States, it does not provide truckers with any great saving in time or mileage. The former is reduced for trucks and busses by about 90 minutes and the latter by 22 miles.

The unhappy fate of the turnpike was perhaps foretold when the facility was but a gleam in the eye of its patron, former Gov. Okeyl Patterson Although the enabling act that established the Turnpike Commission specified that the road have "multiple lanes in either direction," the two lane stretch was placed under contract.

After construction was started, a lawsuit was filed challenging the commission's right to build a two lane road when legislation called for a dual facility. A delay of five months resulted.

Then the overall cost soared. Scheduled as a $96 million highway, bonds of that amount were sold in 1952. Two years later another $37 million issue was sold to pay the unexpected boost, directly attributed to the difficulties encountered in overcoming the rugged terrain through which the highway was to run.

• **Possible solutions**—Even before the turnpike was opened in November 1954, the state considered a route north from Charleston to Wheeling and Weirton. Later, the price tag estimated at $238 million was presented to the legislature. That body balked, despite an admission that failure to extend the route would place the turnpike in financial jeopardy. But the early signals that the turnpike would not pay its way cooled off the lawmakers when it came to providing or authorizing another huge sum for the connecting route.

Governor Underwood has suggested refinancing the turnpike on a short-term basis, but the proposal is predicated on the inclusion of U.S. Route 21 in the federal-aid system. However, he has failed to explain just how the short-term financing would be accomplished.

A Charleston lawyer and also a former chairman of the Turnpike Commission, A. Garnett Thompson, has offered a possible answer to the near term problem. He proposed that:

• The commission be allocated that proportion of the gasoline tax collected by the state from motorists and truckers for fuel used in traveling the turnpike.

• The state pay the salaries and expenses for the police detachment assigned to the turnpike, an expense now reimbursed to the state by the commission.

• The commission be relieved of the gasoline tax it now pays on fuel used in its own trucks and other maintenance equipment.

Mr. Thompson said that, if placed in effect, the measures would supply the commission with approximately $1 million additional net revenues annually. This would be about 20% of the annual interest payment.

A variation of Mr. Thompson's first suggestion with respect to gasoline tax refunds is actually in practice in Massachusetts on that state's new turnpike. However, the tax is proportionately refunded directly to the highway's users.

But in both cases, the basis for such refunds is generally the same—toll and tax are a form of double taxation. The argument forwarded is that motorists, who after paying gasoline taxes for the construction and maintenance of state free roads, use up the taxed gasoline to ride on a turnpike whose construction and maintenance they are paying for through a special toll levy.

In the case of the West Virginia Turnpike, refunding a proportion of the gasoline tax to the commission would theoretically benefit the residents of the state since the debt burden would be more quickly eliminated.

It also could be said that the tax refunding would be taxing the people twice in order to pay off the bondholders.

Jackson Phillips of Dun and Bradstreet Inc., in the National Municipal Review, recently presented a study of the proposals along with arguments set forth by opponents and proponents of rescuing the highway.

• **Do nothing**—His report outlined a school of thought that says, "let nothing be done." This group explains that the turnpike was financed with revenue bonds and that each bond explicitly states that neither the state or its political subdivisions shall be obligated to the bond or its interest. In addition, the commission paid for the lack of state backing in the form of a 3.75% interest rate on the first $96 million in bonds and 4.125% interest on the second issue of $37 million. In short, the investors accepted a risk, but also required a higher interest rate because of the greater risk involved. In this case, risk has proved high and investment quality low.

There are those, however, who look at other political and financial realities. The fact is, that a default will not help the state's credit rating even though it is not legally responsible for the bonds.

Already, bond authorities report that counties and municipalities are starting to reject much needed public improvements because of soaring interest rates. A turnpike bond default will drive rates even higher and taxes will have to be increased to pay greater debt service on bond issues to finance schools, roads and airports.

Whether the legislature will act to forestall default is now uncertain. As the June deadline nears, closer consideration may be given to the financial reverberations that will result from a default.

But based on past events, the turnpike is a problem that the legislature apparently is eager to avoid. In a recent extra session, the road's problems were not included in the limited agenda.

In addition, the proposal to refund to the Turnpike Commission the gasoline tax collected on the turnpike is not new. It is one that has been corridor and cloakroom conversation among the lawmakers since early 1955. Up to the present time, no action resulted from the talk.

Up until June 1, 1956, interest on the bonds was paid from a fund established through the original sale of the bonds. Since that date, interest has been met from current revenue and the revenue fund built up during the years when the debt was paid from capitalization.

It is expected that the December 1 interest payment will be met, but present indications are that only about $1.8 million will be available from current earnings to meet the June payment of slightly less than $2.6 million.

(*B&F continued on page* 382)

Bigger Tax Take

Move to block gas tax fails; road program aided

Failure of a move to block a one cent boost in Nebraska's gasoline tax clears the way for that state to add $5 million to its $39.4 million road construction program during the 1957-59 period.

Last spring, the state legislature voted the increase to bring the total state gasoline tax to seven cents a gallon. Opponents of the tax hike sought to prevent it by circulating petitions for a referendum that would have been aimed at killing the measure. But the attempt failed when the petiton drive fell approximately 1,000 names short of the required number of valid signatures.

With the failure of the petition drive, the tax increase became effective Sept. 20. Spearheading the anti-tax increase campaign was the Nebraska Farm Council, composed of the Farmers Union, the Farm Bureau Federation and the State Grange. The council was joined in its efforts by the petroleum industry, the railroad brotherhood unions and the Rural Letter Carriers Association.

In addition to the $5 million state highway construction program, the added revenue brought in by the tax increase will supplement federally-aided interstate highway work scheduled for the 1957-59 period.

According to State Engineer L. N. Ress, the $5 millon annual increase in revenue derived from the increase will be allocated as follows:

- $3.9 million to the highway department and the remainder to the counties.
- $2.5 million of the state's share will go for regular road work and $1.4 million to the interstate system.

The regular funds, on a 50-50 matching basis, will add a total of $5 million in construction to the state system and $10 million in the 90-10 federal-aid interstate system.

Building Index Climbs; Construction Index Dips

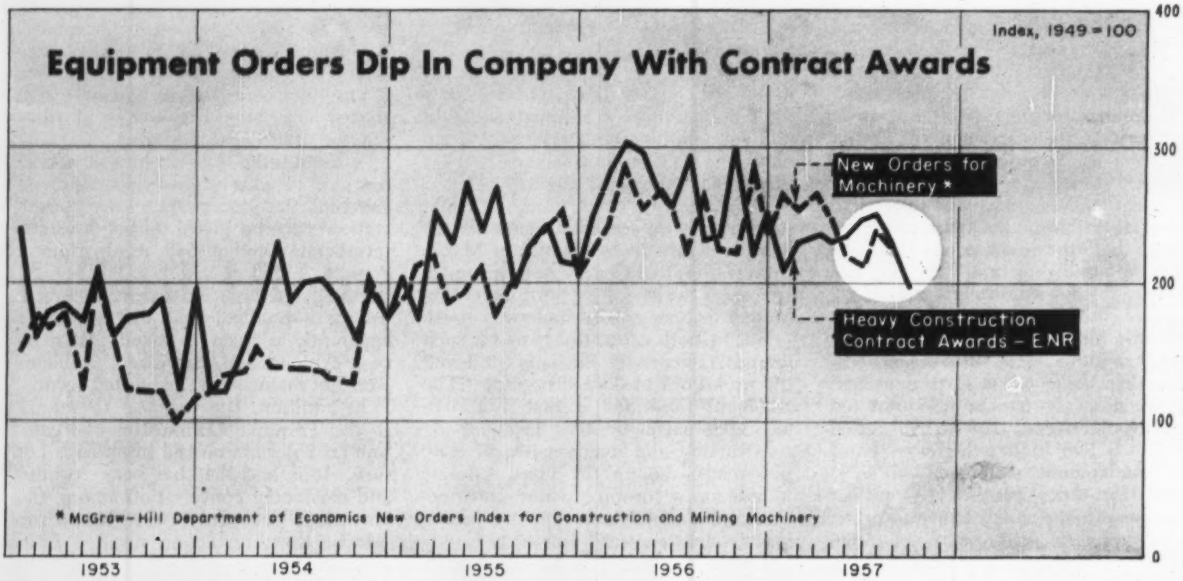
Wage boosts for skilled construction labor have pushed costs up in the last month as measured by ENR's 20 Cities Building Cost Index. A fall in lumber prices is not sharp enough to offset the effects of wage hikes for bricklayers and structural ironworkers, therefore the Building Cost Index is boosted to 517 this month from its previous 516.

However, the drop in lumber prices is reflected in the Construction Cost Index which fell from 738 in September to 737 this month.

Both of these ENR indexes are based on 1913 = 100.

Prices have changed in two U. S. and two Canadian cities. A wage increase of 10 cents hourly for bricklayers in Baltimore pushed the Baltimore Building Cost Index up two points from 518 to 520.

In Cincinnati, a drop in Douglas fir prices of $3.25 Mfbm and a $2.50



* McGraw-Hill Department of Economics New Orders Index for Construction and Mining Machinery

Proposed Work Slump Slows Machinery Orders

Heavy construction contracts skidded lower in September to an index value of 199, based on 1949-100. The drop represented the lowest index value reported by ENR since August, 1955. In addition, it is the lowest September value since 1954. (The index is based on average weekly contract volume during the month.)

The drop in contracts was accompanied by a decline in new orders for construction machinery, although the machinery drop was a more moderate one than the contract award curve.

The August New Orders Index was 226, based on 1949-100. The August dip was 6% below July but 17% under last year when new machinery orders set an all-time high for the month. But the McGraw-Hill Department of Economics Index shows 1957's August orders as second highest for the month.

The machinery orders index should hold up to the August level for two more months to reflect fully the February-July boost in contracts.

The recent drop in awards reflects a sharp decline in new proposed work earlier this year. However, the August-September jump in proposed work entering the planning stage is expected to bolster contract volume in the latter part of this year.

Mfbm drop in pine brought the Building Cost Index down to 504 from 507.

A three cent wage increase for common labor in Montreal raised that city's Construction Cost Index from 585 to 591.

Toronto's Building Cost Index went up one point to 471 as a result of a boost in the price of lumber. The Construction Cost Index also showed a rise to 609, a one point hike.

Tax Battle Lost

Contractor defeated in tax invalidation attempt

A contracting firm has lost a court fight to eliminate New Mexico's used or "compensating" tax law that requires tax payments on goods bought outside the state for use or consumption within New Mexico.

The State Supreme Court, in upholding the validity of the use tax act, ruled that the Robert E. McKee Co. of El Paso, Tex., and Albuquerque, N. M., must pay the compensating tax on materials it bought outside the state and used on federal projects in the state.

The tax is levied on all out-of-state purchases to compensate for the loss of sales tax revenue.

The McKee company paid $31,850 in such taxes under protest, then filed suit in the First District Court at Santa Fe attacking the validity of the law. The lower court upheld the act and the company appealed.

Charles B. Barker, counsel for the State Bureau of Revenue, described the decision as an important one. There are several other similar cases on which trial was delayed pending the outcome of the McKee case.

Mr. Barker said that in most, if not all of the pending suits, it was stipulated that judgments would be the same as those that might occur in the McKee suit.

There has been some speculation that the McKee company may carry the suit to the U. S. Supreme Court.

Pacific Clay Acquires Tillotson Refractories

Pacific Clay Products of Los Angeles has bought Tillotson Refractories Co., Corona, Calif., a completely integrated firm manufacturing vitrified clay pipe.

Tillotson owns 110 acres of deep clay deposits close to its plant, which covers 150,000 sq ft and is equipped with 10 kilns. Another kiln is scheduled for operation shortly. The company employs about 100 persons.

Machinery Prices Are Boosted

Out of 43 lines of construction machinery, 17 carried higher price tags in August than in July. Increases ranged from 1.7% for cable-controlled dozers to 7.6% for 105-125 cfm capacity portable air compressors.

The July 1 steel price boost is fully apparent in the broad wave of price hikes posted by machinery manufacturers in August. The new prices bring the U. S. Bureau of Labor Statistics over-all index of primary market prices to a record of 161.6 (based on 1947-49 = 100).

This represents a 2% increase for the month and a 7.8% increase over one year ago (See table).

Eight types of construction machinery now are over 10% more costly than one year ago.

Construction Equipment Price Trend—August 1957

BLS Primary Market Price Indexes, U. S. Department of Labor, 1947–49 = 100

	Aug. 1957	July 1957	Aug. 1956	% Change Month	Year
All Types of Equipment	161.1	157.9*	149.4	+2.0	+7.8
Cranes, Draglines, Shovels	160.2	160.2*	149.0	0	+7.5
Shovel, ½ cu yd	150.9	150.9	142.8	0	+5.7
Shovel, ¾ cu yd	162.9	162.9	154.0	0	+5.8
Shovel, 1–1½ cu yd	172.4	172.4	161.8	0	+6.6
Shovel, 2 cu yd	147.1	147.1*	134.2	0	+9.6
Shovel, 3–3½ cu yd.	158.3	158.3	151.3	0	+4.6
Shovel, 6 cu yd.	176.5	176.5*	161.2	0	+9.5
Crane, truck mounted	162.1	162.1	153.7	0	+5.5
Bucket, clam shell	152.7	152.7	136.7	0	+11.7
Bucket, dragline	180.8	180.8	165.1	0	+9.5
Crane, tractor mounted	131.7	131.7	120.3	0	+9.5
Machinery, Tractor Mounted	160.2	155.8	146.6	+2.8	+9.3
Dozer, cable control	151.6	149.0	149.4	+1.7	+1.5
Dozer, hydraulic control	175.1	170.6	153.9	+2.6	+13.8
Cable, power control unit	147.9	139.9	135.0	+5.7	+9.6
Loader, shovel type	151.3	148.6	139.4	+1.8	+8.5
Specialized Machinery	144.8	144.6	135.8	+0.1	+6.6
Ditcher	151.8	151.8	140.8	0	+7.8
Roller, tandem	181.7	181.7	164.9	0	+10.2
Roller, 3 wheels	154.8	154.8	146.4	0	+5.7
Ripper and rooter	143.3	138.1	132.4	+3.8	+8.2
Dewatering pump 10 M gph	108.1	108.1	105.4	0	+2.6
Dewatering pump, 90 M gph	133.3	133.3	124.3	0	+7.2
Portable Air Compressors	156.6	146.2	133.2	+7.1	+17.6
Capacity, 105–125 cfm	163.7	152.2	138.4	+7.6	+18.3
Capacity, 210 cfm	149.5	140.5	127.7	+6.4	+17.1
Scrapers and Graders	153.5	150.1	143.6	+2.3	+6.9
Scraper, 4 wheel, 8–8.4 cu yd.	155.0	155.0	145.2	0	+6.7
Scraper, 4 Wheel, 14.4–15.2 cu yd	151.3	143.9	136.0	+5.1	+11.3
Scraper, 2 Wheel (a)	118.4	113.6	110.5	+4.2	+7.1
Grader, heavy duty	159.3	154.9	148.4	+3.8	+7.3
Grader, light & medium	152.2	152.2	145.0	0	+5.0
Contractors Air Tools	164.3	153.6	150.0	+7.0	+9.5
Paving breaker	164.6	154.4	149.3	+6.6	+10.2
Mixers, Pavers, Spreaders	143.1	143.1	134.5	0	+6.4
Mixer, portable, 6 cu ft	144.1	144.1	136.9	0	+5.3
Mixer, portable, 11 cu ft	151.7	151.7	145.3	0	+4.4
Mixer, portable, 16 cu ft	153.6	153.6	144.8	0	+6.1
Mixer, truck, 4½ cu yd.	122.1	122.1	113.7	0	+7.4
Mixer, paving, 34 cu ft	171.2	171.2*	153.7	0	+11.4
Concrete finisher	171.1	171.1	160.0	0	+6.9
Bituminous distributor	115.9	115.9	108.3	0	+7.0
Bituminous spreader	160.3	160.3	149.9	0	+6.9
Bituminous paver	149.8	149.8	143.9	0	+4.1
Tractors	175.2	169.3	162.8	+3.5	+7.6
Wheel-type, off-highway (a)	122.1	118.6	113.7	+3.0	+7.4
Crawler type					
30–35 dhp	170.8	166.5	162.8	+2.6	+4.9
37.0–45.1 dhp	177.6	172.3	163.6	+3.1	+8.6
60.5–75.0 dhp	183.4	176.6	168.5	+3.9	+8.8
102.0–116.0 dhp	182.4	172.3	166.2	+5.9	+9.7
126.0–155.0 dhp	183.5	178.3	173.6	+2.9	+5.7

(a) 1950 = 100 *revised

Hoffa's Election Is Challenged

Sen. McClellan leads fight to unseat Mr. Hoffa as teamsters' showdown with the AFL-CIO draws near

With the teamsters' day of judgment by the union's peers only a week away, a new attempt to clip the wings of teamster President Elect James R. Hoffa has been made by Sen. John McClellan, chairman of the Senate Select Committee on Improper Activities in the Labor-Management Field.

Senator McClellan last week accused the union of "scandalous" conduct in seating delegates to its Miami Beach convention and said that without such action Mr. Hoffa "could not have been elected president." The circumstances under which the election occurred, he stated, are "a matter for the courts." (The union was directed by the Circuit Court of Appeals of the District of Columbia to seat only properly appointed delegates.)

The statement was made after a "preliminary examination" of delegate credentials subpoenaed by the McClellan committee. Earlier, a union attorney had informed the committee the records had been burned inadvertently. But later, the bulk of them were said to have been salvaged, and were turned over to the committee. The senator said they "are, to say the least, inadequate."

The new accusations relate primarily to constitutional irregularities rather than to corruption. The crux of the problem is that election of many delegates apparently occurred too close to the convention date. The union constitution required the elections to be held at least a month before the convention opened. Senator McClellan has accused Dave Beck of instructing the Credentials Committee to disregard this requirement.

Meanwhile, the AFL-CIO has moved the crucial meeting of its Executive Council on Oct. 24 from New York to Washington. At that time, the council will decide whether to drop, suspend or continue its ouster proceedings against the teamsters.

For the first time since the corruption charges were preferred, the teamsters' fight before the AFL-CIO will be led by Mr. Hoffa, who has said that he and the teamsters will "do everything in our power to remain in the united labor movement." Following his election as president, he told the delegates that, if given time, he will make the union a "model" of honest trade unionism and said, "I want to promise you here and now, I will devote myself and all my energies to serve you honestly and sincerely, and with God's help, I pledge to do all in my power to lead you and this organization to a position of respect and honor in the eyes of the rank and file of labor; in the eyes of the nation; in the eyes of the world."

If the Executive Council decides to suspend the teamsters, the matter will go before the AFL-CIO's second constitutional convention, which opens in Atlantic City, N. J., Dec. 5.

In the call for the convention, AFL-CIO President George Meany emphasized the federation's efforts to rid the labor movement of all corrupt elements. "Upon the convention decisions," he stated, "rests, in great part, the future of the American labor movement as an integral force for good and morality in our nation."

DELEGATE CREDENTIALS from teamster convention are turned over to Senate Select Committee counsel Kennedy. Sen. McClellan says they evidence "scandalous" conduct.

Bargaining in Advance

Experiment in pre-season bargaining tried in Ohio

An experiment in pre-season contract negotiations is under way in Columbus, Ohio, where virtually all the building trades unions will have concluded new labor agreements by the end of the year—four months before most of the present contracts expire.

The experiment has evoked widespread interest within the industry and, if successful, may introduce a new concept into collective bargaining. The Columbus groups hope to be able to negotiate subsequent contracts let six months to a year in advance of expiration dates.

Several unions already have reached agreement on new contracts. First to sign was Local 98 of the sheet metal workers union. It has accepted a two-step hourly wage boost: 17½ cents May 1 and 7½ cents Nov. 1. Another 2½ cents will be paid for welfare, making the employer contribution to the union's welfare fund 10 cents an hour. The contract becomes effective on May 1, the time when the existing agreement expires.

In explaining the experiment, union leaders claim they can bargain in better grace in the off-construction period. Contractors are hoping it will free the peak construction period from the uncertainties and headaches of collective bargaining.

"We can bid more intelligently on major projects if we know what our labor costs will be," one industry spokesman said. Generally, contractors have had to figure "in the dark."

Unions presently negotiating include the carpenters, roofers and hod carriers. Painters will not attempt to negotiate until after the first of the year. The plasterers have reached agreement with plastering contractors but not with cement contractors.

Right-to-Work Laws

Problem is shaping up as big 1958 political issue

Right-to-work legislation, bitterly opposed by the building trades unions, will be one of the major issues in the 1958 election campaigns of Goodwin J. Knight and William F. Knowland for California's Republican nomination for governor.

Senator Knowland, at odds with Governor Knight over the issue, announced earlier this month that he will seek the governorship.

The senator said that, as governor, he would be prepared to sign a "fair and equitable" right-to-work bill and indicated he would recommend legislation for a labor "Bill of Rights" and "Union Democracy."

Queried about the 1944 California election defeat of a right-to-work initiative, Senator Knowland replied that sentiment may have changed.

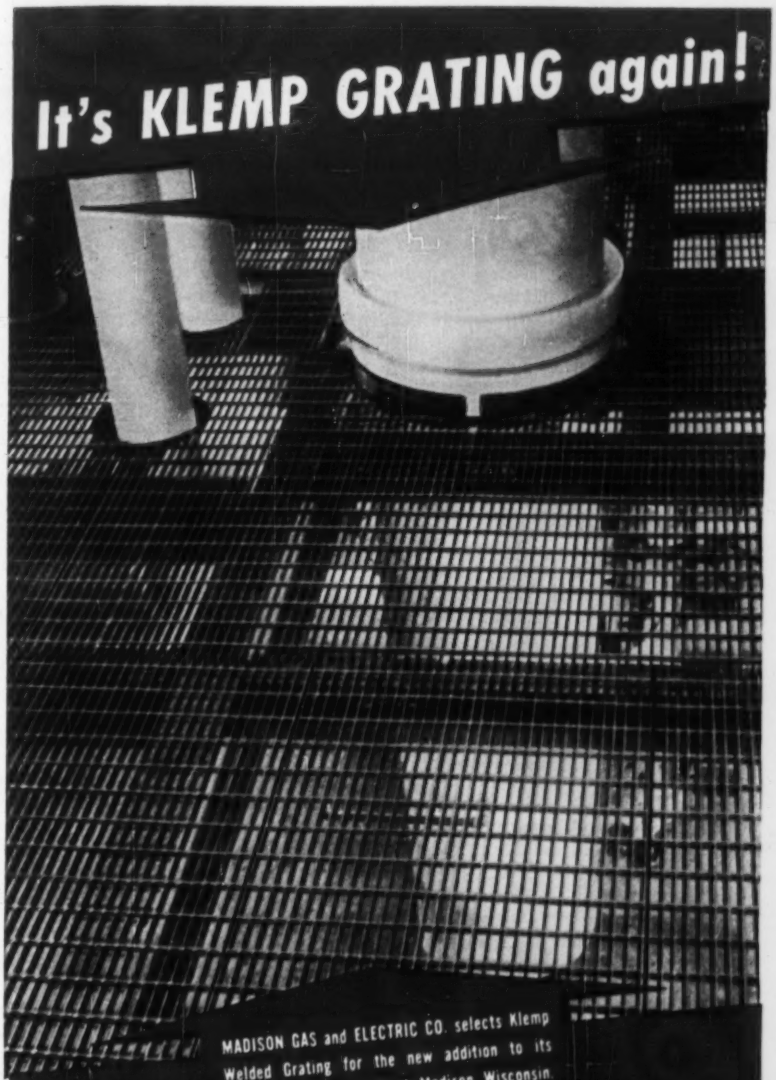
Right-to-work laws, which have the effect of outlawing union shops, generally prohibit imposing union membership as a condition of employment. Eighteen states now have such laws. California has been the first to try putting such legislation on the books of political subdivisions, such as cities and counties.

Pointing to the disclosures of the Senate Select Committee on Improper Activities in the Labor-Management Field, Senator Knowland said the investigations afford a basis for new thinking on the right-to-work issue. He claimed he already has rank and file labor assurances of support for his position, including his advocacy of protection for health and welfare funds and general union funds.

Governor Knight has differed strongly with Senator Knowland on the right-to-work problem, declaring such legislation would disrupt labor-management peace in California.

Political interest in the issue, however, will not be limited to California. A referendum is authorized for Kansas and a measure is certain for Idaho.

(*Labor continued on page 386*)



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Unions Continue Craft Disputes

Persistent jurisdictional disputes mar progress on New Jersey generating plants and Ice Harbor Dam

Inter-craft jurisdictional disputes over work assignments are piling up extra costs on two major projects on the East and West Coasts as a federal court clears the way in another area for a contractor suit against a union for damages resulting from jurisdictional warfare.

Work stoppages have occurred in two of the unsettled disputes focusing attention on some of the difficulties the construction industry's National Joint Board for the Settlement of Jurisdiction Disputes encounters at the local level. Prevention of jurisdictional work stoppages is one of the principal aims of the Joint Board procedure, which was established voluntarily by labor and management for the orderly resolution of jurisdictional disputes (see story on page 158).

• **New Jersey**—The eastern dispute erupted in Ridgefield, N. J., on construction of a $129 million generating plant by United Engineers and Constructors of Philadelphia, Pa., for Public Service Electric & Gas Company. The project was hit by an eight-day strike of operating engineers who claimed they should maintain electric welding machines instead of the crafts, such as steamfitters, plumbers or sheet metal workers, that might be operating them.

The Ridgefield project is one of three new multi-million-dollar plants for Public Service. During construction of the first plant in Linden, 300 electric welding machines were used. When the maintenance claim was advanced by the engineers, it was agreed to hire one engineer for every 10 machines. This is estimated to have added more than $300,000 to the project's cost.

The one in 10 formula was carried over to the Ridgefield job, where 250 to 300 welding machines will be used. As costs mounted, so did resistance to the engineers' demands. Six members of engineers' Local 825 were laid off. The union pulled 35 more off the job. United Engineers and the Building Contractors Association of New Jersey referred the dispute to the Joint Board. The association contends a 1937 decision in the Joint Board's Green Book establishes welding machine maintenance as the work of the operating trade.

At the Joint Board's request, William Maloney, general president of the operating engineers union, instructed the men to return to work. The instructions were ignored and the strike ended only when the local union and United Engineers reached a compromise which reportedly gives the union a "50% improvement" over the one to 10 formula. The agreement applies only to the Ridgefield project.

Paul Brienza, managing director of the New Jersey Contractors' Association, last week said that although the Ridgefield dispute has technically ended as far as the Joint Board is concerned, the basic dispute is still unresolved. It has already cropped up, he stated, on a $1 million project for Mennen Co. in Morristown and may break out again on the third plant to be built for Public Service in Mercer County. Meanwhile, the same issue has been taken to the National Labor Relations Board by the Mechanical Contractors Association of New Jersey in an unfair labor practice case on which hearings commenced in the Newark regional office of the NLRB on Oct. 10.

• **Washington**—In Pasco, Wash., work on Ice Harbor Dam has encountered similar difficulties—this time because of a dispute between carpenters and iron workers over the right to rig concrete forms. The dispute, which also caused a work stoppage last April, idled 700 workers for two and a half weeks commencing Sept. 9.

Work was resumed under a preliminary agreement, according to officials of Montag, Halvorson, Austin & Associates, contractors on the first phase of the project. But the truce appears to be an uneasy one and the carpenters reportedly are still claiming the right to rig all wooden forms. (About 60% of the forms used are steel and the other 40% are wooden.)

During the stoppage, the Spokane Associated General Contractors asked the NLRB to start proceedings for an injunction. The request was granted but the stoppage ended before it was processed.

• **Damage suits**—Meanwhile, the U. S. District Court for the Eastern District of Illinois has struck a promising note for contractors in a suit against the plumbers union by L. R. Young Construction Co.

The court ruled that a suit for damages under Section 303 of the Taft-Hartley Act is properly before a court if the contractor states in his complaint that an offending union protested work assignments by engaging in jurisdictional disputes with other crafts and by encouraging work stoppages.

It was also held that an arbitration clause in a labor contract does not bar the right to sue for damages. The court refused to assume "that the parties intended to stipulate away the penalties for wrongful and illegal conduct" and said:

"It is clear that the arbitration clause . . . was to serve the purpose of avoiding labor strife, and related to the controversies which were made subject to the grievance procedures and not to claims for damages. . . ."

Sheet Metal Worker Wins A Right-to-work Verdict

A jury verdict of $50,000 has been returned against the Sheet Metal Workers' International Association for violation of the Arizona right-to-work law, which bans the imposition of union membership as a condition of employment.

Tried in Mohave Superior Court, the case was brought by Carl Nicholas, a sheet metal worker, who claimed he was fired from a job in Arizona because he was not a member of the union. He charged the union used its influence to keep him from finding employment as a sheet metal worker elsewhere, and asked for $15,000 compensatory and $35,000 punitive damages.

Named as codefendants in the suit were Dorington Co. of Colorado, Mehring & Hanson Co. of Nevada, and Ritter Heating & Plumbing Co., also of Nevada. The jury verdict was against the union only.

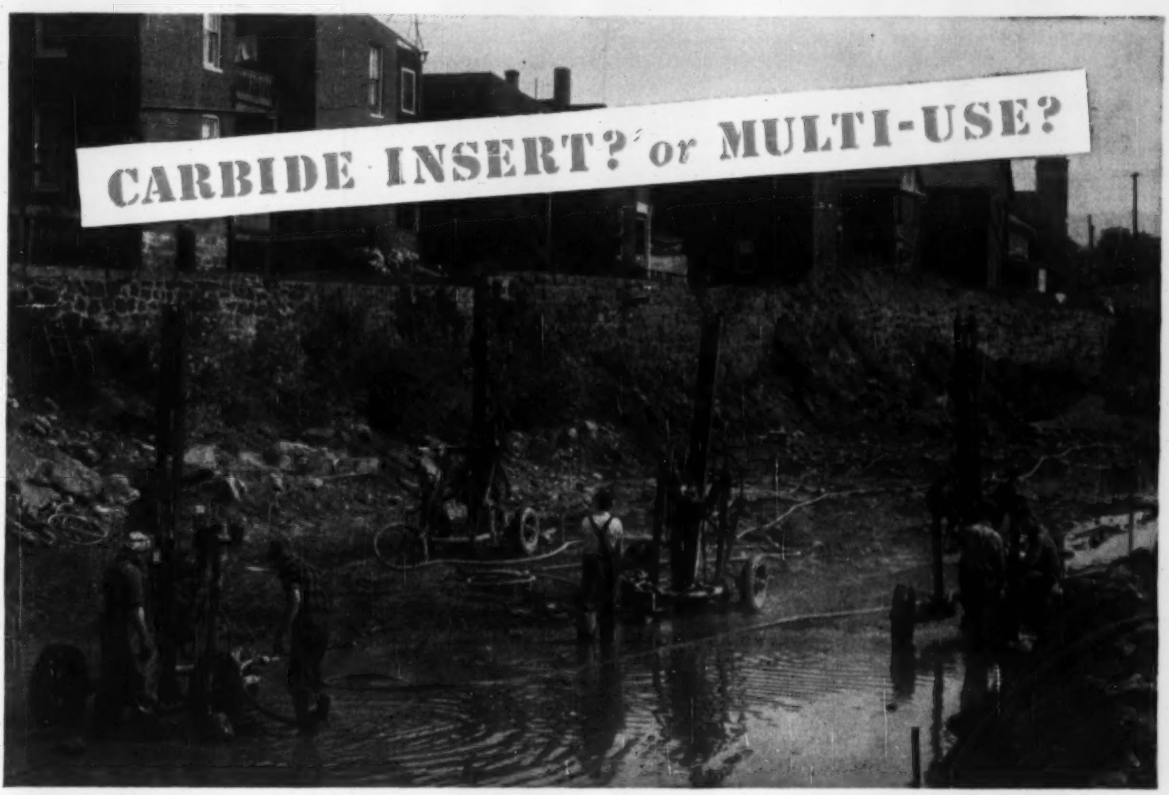
The union, which earlier claimed unsuccessfully that the state court had no jurisdiction under the doctrine of federal supremacy, said it will appeal.

Funds for Industry Board Called Violation of Law

Confirming the doubts of many contractors, a federal court has ruled against the legality of employer contributions to funds jointly established for miscellaneous use, including apprentice training.

In an action begun by the Sheet Metal Contractors Association of San Francisco, the U. S. Circuit Court of Appeals for the Ninth Circuit has held that contractor payments to a local union-contractor joint industry board

(*Continued on page 391*)



CARBIDE INSERT? or MULTI-USE?

LOCATION: *Flood control project on Will's Creek, Cumberland, Md.* **OPERATING CONDITIONS:** *Soft to medium limestone*

TIMKEN® multi-use bits most economical, gave lowest cost per foot-of-hole in Maryland flood control project

. . . says E. J. Albrecht Company of Chicago, Illinois

IN drilling through soft to medium limestone on a flood control project in Cumberland, Md., E. J. Albrecht Co. got lowest cost per foot-of-hole with Timken® multi-use rock bits. With correct and controlled reconditioning, Timken multi-use bits give the lowest cost per foot-of-hole when full increments of steel can be used in ordinary ground.

But in hard, abrasive ground, Timken carbide bits would have been the best bit to use. They give you higher speeds and greater economy in extremely deep holes, constant gauge holes, small diameter blast holes.

Both Timken multi-use and carbide insert bits are time-savers. They're interchangeable in the same thread series. Dozens of different bits fit the same drill steel. Bit-changing goes fast and easy right on the job.

Timken rock bits are made from our own electric furnace fine alloy steel. And they have special shoulder unions to protect threads against drilling impact.

For help in selecting the best type bit for your jobs, to cut your drilling costs, write: The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

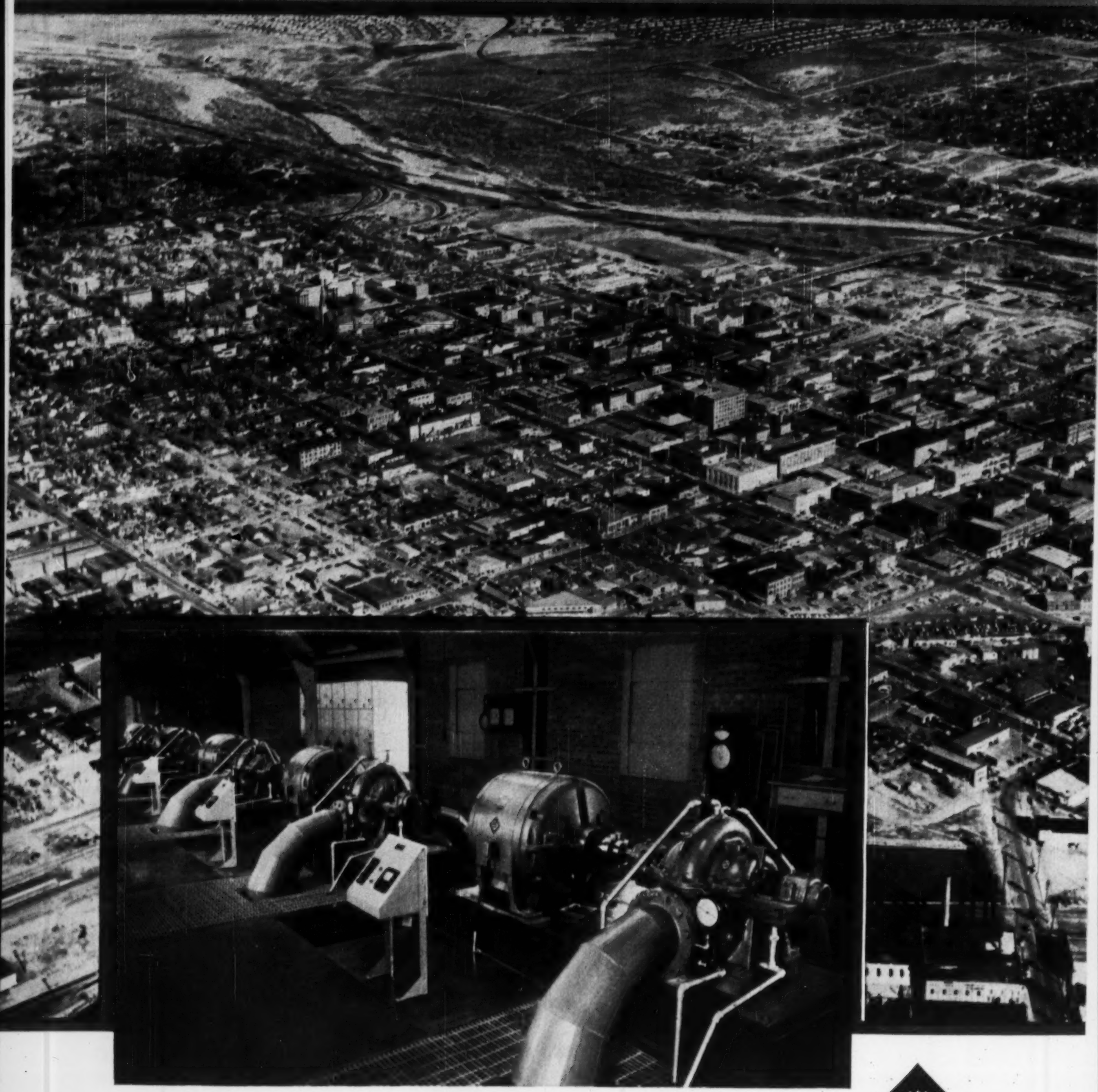
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit for every job

See the next Timken Televent hour, "The Innocent Years" over NBC-TV, Thursday night, November 21st.

Pueblo,



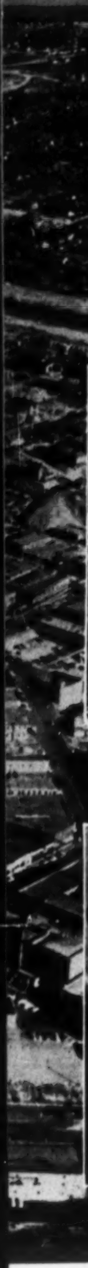
Allis-Chalmers pumps, motors and control at the District No. 2 Water Works—two 12 x 10 SHS pumps, 3500 gpm, 290 ft, driven by 350-hp, 1770-rpm motors; and three 12 x 10 SH pumps, 6000 gpm, 290 ft, driven by 600-hp, 1770-rpm motors.

A-C
ALLIS-CHALMERS

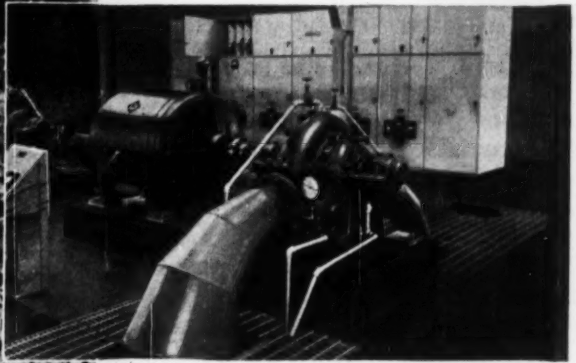
A-5397

Colorado

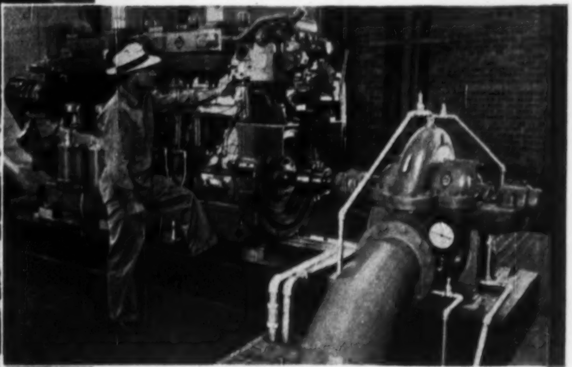
increases pump capacity...



Confidently purchases Allis-Chalmers equipment for continued satisfaction based on proven past performance



One of two 12 x 10 SHS pumps, 3500 gpm, 290 ft, driven by 350-hp, 1770-rpm motors, and line-up of Allis-Chalmers Type H high-interrupting capacity motor control.



One of two 12 x 10 SI pumps, 3500 gpm, 290 ft, driven by Allis-Chalmers 340-hp, 1200-rpm diesel engines.

THIS progressive industrial city of 100,000 expects to double its population in less than 30 years. This growth pattern called for increasing pump capacity to 41 mgd and provisions for future expansion. Because Allis-Chalmers equipment had given dependable, low-maintenance, high-efficiency service in the past, Pueblo assured itself of outstanding service by again specifying Allis-Chalmers.

Your community, too, can save time and money—assure itself of the same satisfaction—by conferring with Allis-Chalmers engineers early in the planning stage of your public works project. As the leading builder of public works equipment, Allis-Chalmers offers unequaled experience, vast resources of technical skill and modern, dependable equipment

Your local A-C representative will gladly call in a team of Allis-Chalmers experts to help you or your consultants plan a modernization or expansion program. Call him, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Allis-Chalmers Public Works Equipment

- Hydraulic turbines, generators
- Pumps
- Compressors
- Condensers
- Blowers
- Motor-Generators
- Motors
- Transformers
- Switchgear
- Butterfly Valves
- Diesel Engines

ALLIS-CHALMERS

Aggregate... *Man's Improvement Over Nature*

Annual Production of Aggregate
Over 1,000,000,000 Tons

The giant U. S. aggregate industry produces and processes over one billion tons of stone, gravel, sand and slag annually. The total this year may well go over this sum.

The results? You drive on them. Your plane takes off and safely lands on them. They support the railbeds on which your train runs smoothly and with safety. The buildings in which you live and work are,in many instances, supported by and built of concrete composed primarily of aggregates.

Wherever you live, work and travel . . . the aggregate industry is serving you, quietly, efficiently and economically.

Vulcan Materials Company is proud to play a major part in the growth and service of this essential industry . . . with products vital to the building and maintenance of modern highways, runways, railways, dams, plants and other buildings.

Our products include: Slag • Expanded Slag • Granulated Slag for the manufacture of cement • Gravel and Sand • Crushed Stone • Ready-Mix Concrete • "Enslag Colmix" Paving Materials • Hot and Cold Mix Paving Materials • Cen-Vi-Ro Culvert and Drainage Pipe • Prestressed Concrete Pile and Bridge Members

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are illegal under the Taft-Hartley Act.

The board was established to promote the interests of the sheet metal industry, and, in addition to activities in various fields such as arbitration, it administers a joint apprenticeship program and handles all funds collected under labor contracts, except the health and welfare fund. Board activities are financed by a 2½ cent an hour contribution by employers.

Under Sec. 302 of the Taft-Hartley Act, an employer is not allowed to make payments to his employees except for certain purposes. The latter include compensation for services, deductions for union dues, and contributions for health, welfare and pension funds. Many have felt contributions for apprentice training aren't allowed, and a special exemption was included in the recommendations the construction industry made last March for Taft-Hartley amendments (ENR Mar. 21, p. 174).

The court took the view that the Joint Industry Board is not sufficiently detached and independent from the employees to be outside of the application of the law and that it does not come within any of the exemptions of Sec. 302.

Building Trades United By AFL Fifty Years Ago

The AFL-CIO Building and Construction Trades Department will be marking its fiftieth anniversary when it meets for its regular convention on Dec. 2.

The department was created in November 1907 by the American Federation of Labor under a resolution adopted at its convention in Norfolk, Va. Its charter was issued the following year—on Feb. 10, 1908.

Affiliated with the department are the 19 international unions that make up the building and construction trades within the AFL-CIO. Richard J. Gray, who will preside at the three-day December convention at the Shelburne Hotel in Atlantic City, N. J., has headed the department since 1947.

Convention speakers, in addition to AFL-CIO President George Meany, will include Gov. Robert Meyner of New Jersey; Secretary of Labor James P. Mitchell; James Marshall, executive director of Associated General Contractors; Charles Haxby, President of National Constructors Association; and Rodney Lockwood, past president of the National Association of Home Builders.

Under the department's new constitution, nearly 750 delegates, representing state and local councils and international unions, are eligible to attend.

A state survey shows that . . .

Apprentices Get Big Dividends

What does a budding construction worker get out of a formal apprenticeship program except a chance to learn a trade?

A California study of 1,200 apprentices—and how they fared since they completed their training in 1950—shows that higher pay, steadier employment and faster promotion are some of the benefits gained.

Although the construction industry has lead in the nation in the training of apprentices, the urgent need for more apprentices is one of the industry's serious problems. At the end of last year, there were 188,137 registered apprentices in training. Of these, 112,619 were in the building trades. Despite the fact that this represented an 11% increase over the year before, a number of trades, including painters, carpenters, plasterers, cement masons and structural iron workers, were not training enough apprentices to keep pace with journeymen losses through death, retirement and disability.

Among the statistics turned up by the California Apprenticeship Council in its survey were these:

- Average annual earnings of apprentices who finished their training are $1,400 above the average for manufacturing workers and $790 better than that of contract construction workers.
- About 43% of the 1950 completions are getting above-scale wages.
- Nearly 88% had steady work, with no lost days, in 1955.
- Out of the 1950 group, 92.7% are still in the trade for which they trained and 4% are in related trades. About a third are still with the employers with whom they trained.
- Some 43% have supervisory jobs or have become contractors or employers.

A Look at the Building Trades

Broken down by trade, the survey revealed the following facts about former apprentices in the building trades. (Figures on wages and time worked are for 1955).

Trade	Percent now supervisors or contractors	Average annual earnings*	Percent paid above scale	Percent with no time lost
Painters	64	$5,391	52	81
Lathers	56	6,066	50	50
Plumbers, steamfitters	56	6,488	37	85.4
Plasterers	52	6,397	40	77.4
Carpenters	50	5,667	53	84.2
Brickmasons, tilesetters	40	6,150	40	90

* In comparison, the Los Angeles average for all manufacturing workers was $4,469. For contract construction workers it was $5,265.

Ontario Contractors Seek More Vigorous Labor Laws

Four thousand Canadian contractors in Ontario have asked the Ontario government to make some major changes in the laws applicable to labor.

The recommendations were contained in a brief submitted to the Ontario legislature's Select Committee on Labor at Toronto Sept. 26. Among them were these:

- All forms of illegal picketing should be prohibited.
- Power should be given the Ontario Labor Relations Board to impose penalties for illegal work stoppages.
- Special courts should be established to rule on jurisdictional disputes between unions.
- A licensing bureau should be set up to license combinations of unions that bargain as a single unit.
- More flexibility should be introduced into the conciliation procedure to permit simultaneous bargaining with various building trades unions, one of the aims being to achieve simultaneous termination dates for labor contracts.

Other recommendations included giving civil status to labor unions to facilitate the filing of lawsuits against them, and to enable unions to sue in civil court.

The brief, presented by Toronto contractor J. J. Pigott, represented the views of the Canadian Construction Association, Ontario General Contractors Association, Toronto Building Exchange and 22 allied groups.

Repeal of Section 4 of the Ontario Combines Investigation Act was urged so that unions would be subject to antitrust laws and the law could be applied to joint labor-management activities.

(Labor continued on page 392)

Apprentice Bricklayers To Hold State Contest

Reflecting the construction industry's continuing interest in apprenticeship, a statewide contest of bricklayer apprentices will be held at the North Carolina State Fair on Oct. 18.

Apprentices eligible to compete in the Fourth Annual Apprentice Bricklaying Contest include those registered with the North Carolina State Apprenticeship Council and in active training under a council approved program. Contestants must not have completed more than 30 months of their training.

Sponsors of the contest include the Carolinas Branch of Associated General Contractors, the North Carolina State Conference of the Brickmasons and Plasterers International Union, Brick and Tile Service, Inc., the Labor Department's Division of Apprenticeship Training, the North Carolina Chapter of the American Institute of Architects, the Carolina Lumber and Building Supply Association, the North Carolina Department of Trade and Industrial Education, and the Durham-Goldsboro Construction Apprentice Council.

Contest projects will be judged on a technical point system stressing correct design, neatness, plumb, level, height, production, uniformity of joints, and skill in handling bricklaying tools. Defense bonds donated by Brick and Tile Service of North Carolina will be awarded to the three top contestants, and trophy cups from the Carolinas Branch of AGC will be presented to the first-place winner and his employer.

Labor Briefs . . .

- **Fewer disputes**–The Connecticut State Board of Mediation reports that labor disputes in the state dropped 15% last year. Among the factors cited for the decline were long-term contracts and "progressive and constructive labor-management relations".
- **Welfare funds**–Wisconsin's Insurance Commissioner Paul Rogan says the state will police between 1,000 and 1,500 union and company welfare funds under the new Wisconsin law regulating welfare fund administration. Passed this year, the law is the first to cover funds administered by unions or management as well as jointly administered funds.
- **Safety**–The Eighth Annual California statewide meeting of the Governor's Industrial Safety Conference will meet in San Francisco's Fairmont Hotel Feb. 6-7. The Construction Section has become one of the conference's most active units.

OFFICIAL PROPOSALS

APPEAR HERE EACH THURSDAY. PROPOSAL ADVERTISEMENTS ACCEPTED UP TO 10:30 A.M. FRIDAY FOR THE ISSUE DATED THE FOLLOWING THURSDAY.

Bids: November 14, 1957.

Central Electrica De Furnas S. A. Construction of Hydroelectric Power-Plant

1. Notice is hereby given to interested parties that, until November 14th, 1957 this Company—FURNAS—will receive applications for pre-qualification of bidders for the construcion of a hydroelectric power plant of 1,100,000KW to be built on the Grande river, in the State of Minas Gerais (Brazil), near the town of Passos. The selection of applicants will be of international scope, in view of the magnitude of the work involved and the time-limit established for its conclusion.

2. The main features of this hydroelectric development involve the construction of a rockfill dam with clay core, with a total volume of approximately 10.000.000 m3, 2 (two) river diversion tunnels of 15 m diameter, side-channel spillway, intake and forebay structures and a power-house designed for the installation of 12 (twelve) generating units. Work shall commence during the first semester of 1958, and should be concluded by the end of 1962.

3. The pre-qualification of bidders shall be made by FURNAS on the basis of the professional standing of applicant contractors, experienced in work of the same kind and magnitude. Selected contractors will receive in due course written invitations for the submission of proposals for the execution of the work.

4. Instructions for application for prequalification will be furnished, upon receipt, to interested parties at the FURNAS main office in Rio de Janeiro (Brazil), at rua Sao Jose 90, 3rd floor; and, outside Brazil, by courtesy of the following organizations: U. S. Deparment of Commerce, Trade Development Division, Office of Trade Promotion, Washington D. C., U.S.A.; Canadian-Brazilian Services, 385 Yonge Street, Toronto 1, Ontario, Canada; Canadian-Brazilian Services, 148 Leadenhall St., London EC-3, England.

Central Electrica de Furnas S. A.

Bids: November 6, 1957.

Cable Guide Railing and Wire Fencing Contract 448

SEALED BIDS will be received by the Board of Water Supply at its offices, thirteenth floor, 120 Wall Street, New York City until 11:00 A.M. Eastern Standard Time on Wednesday, November 6, 1957, for Contract 448, for furnishing, delivering and erecting about three miles of cable guide railing and about four miles of wire fencing, including gates; the removal and disposal of about 2,700 feet of existing railing and fencing, and the repairing and rehanging of certain existing gates are also incuuded in the work to be done under this contract. The proposed work is located along the Delaware system in Delaware, Sullivan, Ulster, Orange, Dutchess, Putnam and Westchester counties, New York.

Pamphlets of the contract containing information for bidders, forms of bid and contract, specifications, contract drawings, requirements as to surety, etc., can be obtained in the Secretary's office, Room 1312 at the above address, upon application in person or by mail, by depositing the sum of $5.00 for each pamphlet. Within 30 days following the award of contract or rejection of bids the full amount of such deposit will be refunded for each pamphlet submitted as a bid and a refund of $4.00 will be made for each other pamphlet returned in acceptable condition. Arrangements will be made whereby prospective bidders desiring blueprints of the contract drawings for their use may secure same, the cost thereof to be paid by them.

ARTHUR C. FORD, President, EDWARD C. MAGUIRE, HERBERT M. ROSENBERG, Commissioners; Board of Water Supply; BETTY COHEN, Acting Secretary.

Bids: Oct. 30, 1957.

Triborough Bridge and Tunnel Authority

SEALED BIDS WILL BE RECEIVED BY Triborough Bridge and Tunnel Authority at its office, Administration Building, Randall's Island, Manhattan, New York 35, N. Y., as follows:

Until 11 A. M. on Wednesday, October 30, 1957.

For Throgs Neck Bridge Contract No. TN-4A, Bronx Anchorage Foundation and Superstructure. The bid must be accompanied by a deposit in the amount of $250,000.00.

and

For Throgs Neck Bridge Contract No. TN-4B, Queens Anchorage Foundation and Superstructure. The bid must be accompanied by a deposit in the amount of $300,000.00.

Foundations will be open dredged caissons located in East River, in the City of New York

Bidders may submit bid for either one or both of the above contracts.

Plans, specifications and contract documents may be purchased at the office of the Authority for $30.00, which will not be refunded.

Bids: Oct. 23, 1957.

Triborough Bridge and Tunnel Authority

SEALED BIDS WILL BE RECEIVED BY Triborough Bridge and Tunnel Authority at its office, Administration Building, Randall's Island, Manhattan, New York 35, N. Y., as follows:

Until 11 A. M. on Wednesday, October 23, 1957.

For Throgs Neck Bridge Contract No. TN-3, Two Tower Piers, Boroughs of Bronx and Queens, in the city of New York.

Piers will be founded on open dredged caissons located in East River.

Each bid must be accompanied by a deposit in the amount of $200,000.00.

Plans, specifications and contract documents may be purchased at the office of the Authority for $30.00 which will not be refunded.

CONTRACTORS WATCH THIS SECTION

for New Projects

Publish your announcements thru the "Proposal Section" of Engineering News-Record and get their bids.

OFFICIAL PROPOSALS

RATE: The rate for Official Proposal advertising is $2.10 per line or fraction set solid. Where the advertisement is set other than solid, the space is measured by total space occupied and charged on basis of 12 lines to the inch.

CLOSING DATE: Friday 10:30 A.M. for issue dated the following Thursday.

SEND COPY TO: Official Proposal Division,
Engineering News-Record
P.O. Box 12
New York 36, N. Y.

Bids: October 31, 1957.

New York State Road Work

NOTICE TO CONTRACTORS: STATE DEPARTMENT OF PUBLIC WORKS, ALBANY, N. Y.,—Pursuant to the provisions of the Highway Law, Canal Law, and special provisions for projects financed with Federal Aid Funds, sealed proposals will be received until ten-thirty o'clock A.M., eastern standard time on the 31st day of October 1957, by Henry A. Cohen, Director, Bureau of Contracts, 14th Floor, The Governor Alfred E. Smith State Office Building, Albany, N. Y., for the following projects:

County	Contract No.	Name	Miles	Type	Deposit	Estimated Cost of Work
DISTRICT No. 1, G. L. Nickerson, District Engineer, 353 Broadway, Albany 1, New York						
Albany (Rte. 9)	RC 57-172	Loudon Pt. 2, S.H. 119 Loudon-Crescent S.H. 5555	1.75	Asphalt Concrete=1.67 mi. Misc. Work=0.08 mi.	$36,000 Plans $10	$672,000
Schenectady	FAC 57-18 FASH 57-20	City of Schenectady: Crosstown Conn. Schenectady Crosstown Conn. Pt. 2 Proj. U-323(12)	2.14 (0.88 Acc.)	9" Cem. Conc. Pavt. 48' var. wide=2.51 mi. Asphalt Concrete=0.28 mi. Misc. Work=0.23 mi. 1 Hwy. Sep. Comp. I-Beam 69'	$102,000 Plans $25	$1,847,000
DISTRICT No. 2, L. Ketchum, District Engineer, 109 No. Genesee St., Utica 1, New York						
Montgomery & Oneida	M 57-10	Barge Canal Terminal at Utica Barge Canal Terminal at Fonda	0.44	7' Wire Mesh Fencing and Gates	$600 Plans $10	$10,400
DISTRICT No. 5, E. G. H. Youngmann, District Engineer, State Office Bldg., 65 Court St., Buffalo, New York						
Erie	FAC 57-19	City of Buffalo: Kensington Expressway Sect. 1, Arterial Project U-377(13)	1.73	Demolition of Buildings	$32,000 Plans $10	$573,000
Niagara	FARC 57-173 FAC 57-20 FASS 57-15	Sanborn-Lockport, S.H. 9094 City of Lockport: East-West Arterial Route (West Avenue Section) City of Lockport: Upper Mountain Road Arterial Upper Mountain Road Project F-U-709(7); S-US-USG-474(1)	3.81 (0.50 Acc.)	Asphalt Concrete Ty. 2A=4.26 mi. Misc. Work=0.05 mi. R.R. Sep. Plate Girder 77'	$140,000 Plans $50	$2,515,000
DISTRICT No. 7, R. W. Sweet, District Engineer, 444 Van Duzee Street, Watertown, New York						
Clinton & Essex (Rtes. 9, 9N & 22)	FARC 57-166	Clintonville-Keeseville, S.H. 651 Keeseville-Ausable Chasm, S.H. 5056 Keeseville Village, S.H. 859 Project F-876(4), F-407(9)	1.23	Asphalt Concrete Ty. 1A=1.18 mi. Misc. Work=0.05 mi. Prestress Conc. Br. 75.5'	$45,000 Plans $15	$804,000
Clinton	FASS 57-14	Picketts Corners-Chazy Lake Road, Pt. 2 Project S-437(1)	5.94	Bituminous Surface Treated Gravel	$22,600 Plans $25	$410,000
DISTRICT No. 8, K. G. Rauer, District Engineer, Pleasant Valley Road, Poughkeepsie, New York						
Westchester	FICWE 57-1 HRPRC 57-1 FINETC 57-4	Interstate Route Connection No. 520 Cross Westchester Expressway (Rye Sect.) Hutchinson River Parkway: New York State Thruway-New England Sect. Sub. NE5 (Interchange with Cross Westchester Expressway) Project I-1101(4), I-1068(17)	5.95 (8.95 Acc.)	9" Cem. Conc. Pavt. 2 @ 36' Var. Wide=13.99 mi. Asphalt Concrete=0.91 mi. 1 Hy. Sep. R.C. Rigid Frame 146.2' 8 Hy. Seps. Comp.-I-Beams 177.5', 187.8', 161.5', 206', 176.5', 179.3', 267', and 255.8' 1 R.C. Triple Box Bridge 55.3' 1 R.C. Twin Box Bridge 33.5' 1 Hy. Sep. Comp. Weld. Girder 358.1' 1 R.R. & Hwy. Sep. Comp. Beam and Girder 294.7'	$850,000 Plans $100	$15,500,000

Any projects in this letting that are on the Federal Aid highway systems are subject to the provisions of the "Federal-Aid Highway Act of 1956", being Public Law 627, 84th Congress, approved June 29, 1956, and are also subject to the applicable New York State statutes.

In compliance with the provisions of Section 115 (Prevailing Rate of Wage) Public Law 627, the minimum wages to be paid laborers and mechanics are included in wage schedules that are set out in the bid proposal.

Maps, plans, specifications and proposal forms may be seen and obtained at the office of the State Department of Public Works, Bureau of Contracts, Albany, N. Y., and at the office of the District Engineers noted above, and may also be seen at the office of the State Department of Public Works, 270 Broadway, New York City.

The deposit for Plans and Proposal Forms for each contract is indicated above. A refund will be made in full to bidders for return of one set, in good condition, within 30 days of award, or rejection of bids; refund for all other sets in good condition, similar period, will be 50% of deposit.

Special attention of bidders is called to "General Information for Bidders" in the proposal, specification, and contract agreement, and to the special provisions applying to projects financed with federal funds. Award of a contract is subject to priorities and allocations under the Defense Production Act of 1950, as amended, and all regulations issued thereunder.

Proposal for each contract must be submitted in a separate sealed envelope with the name and number of the contract plainly endorsed on the outside of the envelope. Each proposal must be accompanied by draft or certified check payable to the order of the "State of New York, Commissioner of Taxation and Finance" for the sum as specified in the advertisement and the proposal. The retention and disposal of the bidding check, the execution of the contract and bonds shall conform to the provisions of the Highway Laws, as set forth in "Instructions to Bidders".

The right is reserved to reject any or all bids.

JOHN W. JOHNSON
SUPT. OF PUBLIC WORKS

Bids: October 29, 1957.

Contract LT-160.064

THE PORT OF NEW YORK AUTHORITY
LINCOLN TUNNEL
THIRD TUBE
NEW YORK APPROACH
ALTERATIONS TO MEDIAL DIVIDER

Sealed proposals for performing alterations to the medial divider in the New York Approach to the Lincoln Tunnel will be received at the office of the Chief Engineer of The Port of New York Authority, Room 1100, 111 Eighth Avenue, New York 11, N. Y., until 2:30 P. M. on Tuesday, October 29, 1957, at which time said proposals will be opened and read in Room 1108.

Contract Documents may be seen at the office of the Engineer of Design of the Authorly, Room 1115, and copies will be furnished upon request. No deposit will be required but the documents shall be returned in good condition not later than forty days after the opening of proposals.

THE PORT OF NEW YORK AUTHORITY
Donald V. Lowe, Chairman
New York, October 17, 1957

Bids: December 16, 1957

Government of Iraq Electrification of Basrah Power Project Contract No. (10) Water Treatment Plants

The Development Board and Ministry of Development of the Government of Iraq invite tenders from qualified firms for the supply and delivery, erecion and supervision of operation, of Water Treatment Plants, for Basrah Power Station.

Full information regarding this tender can be obtained on and after October 7, 1957 from Embassy of Iraq in Washington or Messrs. Ewbank and Partners, 10/11 Grosvenor Place, London S.W.1., England.

All Tender Documents are to be submitted in English to the Ministry of Development, on or before 12 noon, local time on December 16, 1957.

Minister of Development.
TS/ 9th Sept., '57

Bids: October 29, 1957.

Contract EXD-120.068

THE PORT OF NEW YORK AUTHORITY
PORT AUTHORITY BUILDING
ALTERATIONS TO ROOMS 1301
THROUGH 1307

Sealed proposals for alterations to Rooms 1301 through 1307 of the Port Authority Building at 111 Eighth Avenue, New York 11, N. Y., will be received at the office of the Chief Engineer of The Port of New York Authority, Room 1100, 111 Eighth Avenue, New York 11, N. Y., until 2:30 P.M. on Tuesday, October 29, 1957, at which time said proposals will be opened and read in Room 1108.

Contract Documents may be seen at the office of the Engineer of Design of the Authority, Room 1115, and copies will be furnished upon request. No deposit will be required but the documents shall be returned in good condition not later than forty days after the opening of proposals.

THE PORT OF NEW YORK AUTHORITY
Donald V. Lowe, Chairman
New York, October 17, 1957

Bids: November 25, 1957.

The Municipality of Metropolitan Toronto Humber Sewage Treatment Plant

Contract D-10-57

Main Building, Digestion Tanks and Related Structures

The Municipality of Metropolitan Toronto invites sealed tenders for the construction of the Main Building, Digestion Tanks and Related Structures of the Humber Sewage Treatment Plant located on the west bank of the Humber River immediately north of the Queen Street extension in the Township of Etobicoke in the Municipality of Metropolitan Toronto.

The Humber Plant will have an average design capacity of 50 million Imperial gallons per day. In general, the work includes the construction of the main building comprising the head house including screening, grit removal and loading equipment, the blower house; the work shop and the administration section; six 110-foot diameter digestion tanks with control gallery, two tanks being equipped with gravity gas holders; a chlorine storage and application building including garage; by-pass sewer, connecting galleries and conduits and all other related structures, equipment and work complete except that the gas engine-driven blowers with auxiliaries will be supplied and installed under another contract. An alternative price is requested on the construction of only four digestion tanks rather than the six digestion tanks indicated in the base bid.

Plans and contract documents may be obtained at the Metropolitan Department of Works, 171 Eglinton Avenue East, Toronto 12, Ontario, upon payment of a deposit of $100.00 which deposit will be refunded upon the return in good condition to the Department of Works of said plans and contract documents.

Tenders must be addressed to the Chairman and Members of the Executive Committee of The Municipality of Mertropolitan Toronto, and must be delivered to the Metropolitan Clerk at his office, 67 Adelaide Street East, Toronto 1, not later than 12:00 o'clock noon, Eastern Standard Time, on Monday, November 25, 1957. Envelopes containing tenders must be plainly marked on the outside as to their contents.

The attention of tenderers is especially directed to the information clauses regarding shortages of material, price submitted, time for completing work, and other contracts.

Each tender shall be accompanied by a certified cheque or cash in an amount not less than two-and-a half percent (2½%) of the total amount of the tender, and all cheques be made payable to the Treasurer of The Muncipality of Metropolitan Toronto.

Conditions referring to tendering as described in the contract documents must be strictly complied with. The lowest or any tender will not necessarily be accepted.

F. G. Gardiner, Q.C., Chairman
Metropolitan Council

W. W. Gardhouse, Clerk
The Municipality of Metropolitan
Toronto

Bids: November 5, 1957.

Contract BP-160.012

THE PORT OF NEW YORK AUTHORITY
BROOKLYN-PORT AUTHORITY PIERS
NEW PIER 10
SUBSTRUCTURE AND DECK

Sealed proposals for the construction of the substructure and deck for New Pier 10 to be constructed at the Brooklyn-Port Authority Piers will be received at the office of the Chief Engineer of The Port of New York Authority, Room 1100, 111 Eighth Avenue, New York 11, N. Y., until 2:30 P. M. on Tuesday, November 5, 1957, at which time said proposals will be opened and read in Room 1108.

Contract documents may be seen at the office of the Engineer of Design of the Authority, Room 1115. Documents will be furnished upon deposit of $50.00 per set for not more than three sets to any one company (each set including one copy of the contract drawings). Additional sets will be furnished upon payment of $50.00 per set, which payment is not returnable. Deposits and payments shall be delivered to the Treasury Department, Room 1001, where a receipt will be issued. The receipt shall be delivered to Room 1115, where the documents will be furnished.

Those who have submitted a bid on the contract will receive a refund of the deposit for each set of documents, not exceeding three, returned within forty days after the opening of proposals. Those who have not submitted a bid will receive a refund of one-half of the deposit for each set of documents, not exceeding three, returned within forty days after the opening of proposals.

THE PORT OF NEW YORK AUTHORITY
Donald V. Lowe, Chairman

New York, October 17, 1957

Prequalification Date: October 29, 1957

Board of Education Bureau of Construction

Notice Re: Prequalification Forms for Contractors

APPROVED AS TO FORM
Acting Corp. Counsel

NOTICE IS HEREBY GIVEN THAT
The Superintendent of School Buildings, Bureau of Construction, 4th Floor, Room 407, 42-15 Crescent Street, Long Island City 1, N. Y. will receive applications for prequalification from contractors who may wish to submit bids for the proposed hereinafter specified contracts as follows:
general construction, plumbing and drainage, heating and ventilating, and electrical work and lighting fixtures for Public School 286, corner of Haring Street and Avenue "Y", Borough of Brooklyn.

Prequalification application forms will have to be secured from and must be submitted to the Superintendent of School Buildings, Bureau of Construction, 4th Floor, Room 407, 42-15 Crescent Street, Long Island City 1, N. Y.

Bids, when advertised, will be received from prequalified bidders only.

Time for submitting prequalification applications by contractors will expire on Tuesday, October 29, 1957.

WILLIAM H. CORREALE
Superintendent of School Buildings,
Design and Construction

Dated: October 9, 1957

Bids: November 12, 1957

Addendum No. 2 to the Contract Documents for All Contracts (One, Two, Three, and Four) of the Sewage Treatment Project to Be Constructed for White Haven Municipal Authority White Haven, Luzerne County Pennsylvania

This Addendum shall be attached to, and made a part of the above noted Contract Documents dated June 1957.

NOTE

(In conformity with the requirements of Article 1.12 of Instructions to Bidders, this Addendum shall be submitted with the Proposal).

The content of the Advertisement (page 1a) is hereby deleted in its entirety and the following content shall be substituted in lieu thereof:

(Advertisement)

Sealed proposals will be received by the undersigned at the Borough offices in the Municipal Building, White Haven, Luzerne County, Pennsylvania, until 6:30 P.M. Eastern Standard Time, November 12, 1957, at which place and time, or shorly thereafter they will be publicly opened and read. Proposals shall cover furnishing all necessary labor, materials, and equipment, and performing all work for the Contracts noted below. Separate proposals will be received upon four (4) parts of the project as hereinafter indicated. Each proposal shall be accompanied by a certified check or bid bond in an amount not less than ten percent of the bid total, all in accordance with the provisions contained in the Contract Documents.

Copies of the Contract Documents, including Drawings and Specifications will be on file, for inspection purposes only, at the offices of the Authority Secretary, at the Atlas Powder Company, White Haven, R.D.1, Pennsylvania; they may also be seen at the office of Gannett Fleming Corddry and Carpenter, Harrisburg, Pennsylvania, from whom only they may be obtained, not to exceed two (2) sets of any particular Contract to a prospective bidder, upon deposit of the following indicated amounts for each set:

Contract One—CONSTRUCTION OF A SEWAGE TREATMENT PLANT AND INTERCEPTING AND OUTFALL SEWERS	$30.00
Conract Two—PLUMBING WORK IN CONNECTION WITH CONSTRUCTION OF A SEWAGE TREATMENT PLANT	$20.00
Contract Three—HEATING WORK IN CONNECTION WITH CONSTRUCTION OF A SEWAGE TREATMENT PLANT	$20.00
Contract Four—ELECTRICAL WORK IN CONNECTION WITH CONSTRUCTION OF A SEWAGE TREATMENT PLANT	$20.00

Full refund will be made (only to actual bidders on the four (4) prime Contracts noted above) for return of one (1) set, no more, of a particular Contract in good condition within fifteen (15) calendar days after closing date for receipt of bids; refund for return of all other sets in good condition within the same period, will be fifty (50) percent of deposit. No refund of deposit will be made for Contract Documents returned later than fifteen (15) calendar days after date of receipt of bids.

Prequalification Date: October 29, 1957

Board of Education Bureau of Construction

Notice Re: Prequalification Forms for Contractors

APPROVED AS TO FORM
Acting Corp Counsel

NOTICE IS HEREBY GIVEN THAT
The Superintendent of School Buildings, Bureau of Construction, 4th Floor, Room 407, 42-15 Crescent Street, Long Island City 1, N. Y. will receive applications for prequalification from contractors who may wish to submit bids for the proposed hereinafter specified contracts as follows:
general construction, plumbing and drainage, heating and ventilating, and electrical work and lighting fixtures for Public School 279, Avenue K, between East 103rd and 104th Streets, Borough of Brooklyn.

Prequalification application forms will have to be secured from and must be submitted to the Superintendent of School Buildings, Bureau of Construction, 4th Floor, Room 407, 42-15 Crescent Street, Long Island City 1, N. Y.

Bids, when advertised, will be received from prequalified bidders only.

Time for submitting prequalification applications by contractors will expire on Tuesday, October 29, 1957.

WILLIAM H. CORREALE
Superintendent of School Buildings,
Design and Construction
Dated: October 7, 1957

Bids: December 23, 1957.

Government of Iraq Electrification of Basrah Power Project

Contract No. (11)

Piping, Valves, Fittings and Lagging

The Development Board and Ministry of Development of the Government of Iraq invite tenders from qualified firms for the supply and delivery, erection and supervision of operation, of Piping, Valves, Fittings and Lagging for Basrah Power Station.

Full information regarding this tender can be obtained on and after September 30, 1957 from Embassy of Iraq in Washington or Messrs. Ewbank and Partners, 10/11 Grosvenor Place, London S.W. 1., England.

All Tender Documents are to be submitted in English to the Ministry of Development, on or before 12 noon, local time on December 23, 1957.

Minister of Development

Read the Official

Proposal Columns of

ENGINEERING NEWS-RECORD

This Week and Every Week

EMPLOYMENT OPPORTUNITIES

NATIONAL COVERAGE

The Advertisements in this section include all employment opportunities—executive, management, technical selling, office, skilled, manual, etc.

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Positions Wanted	Selling Opportunities Wanted	Employment Services
Part Time Work	Selling Opportunities Offered	Labor Bureaus

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BRIDGES
HIGHWAYS
INDUSTRIAL

Please submit complete resume giving education, experience, salary desired, and date of availability.

R. W. BOOKER & ASSOCIATES
Consulting Engineers
1722 Olive St., St. Louis 3, Mo.

ENGINEERS

Foreign Employment

MAINTENANCE, SCHEDULING & PROGRAMMING

Career opportunities for graduate engineers with minimum 6 years experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations and supporting community facilities. For work in Saudi Arabia as Staff Engineers. Also opportunity for engineers with production control experience.

High salary plus living allowance and liberal all-inclusive benefits conducive to large savings. Excellent community facilities.

Write outlining background and experience. Please include telephone number.

Recruiting Supervisor, Box 215

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

REPLIES (Box No.): Address to office nearest you c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Superintendent experienced in heavy sewer & water main construction under difficult conditions, by N. Y. State Contractor. Permanent position for qualified, responsible person looking for advancement with established firm. P-6165, Engineering News-Record.

University Career for Engineers—A number of teaching posts are open at a Canadian Engineering College in the fields of Civil, Electrical and Mechanical Engineering. The academic term extends from September 15th to May 1st and summer months are free for study, research or professional practice. Teaching loads run at 6 to 9 lectures and 3 to 9 laboratory hours, with a maximum of 15 hours per week. Salaries are open, depending on qualifications. Good pension and medical plans. Prime present requirements are in the fields of hydraulics and electronics but engineers in any of the three major fields are invited to inquire. P-6229, Engineering News-Record.

Wanted: Man with Initiative and Know How to manage Reinforcing Fabricating Department of an aggressive midwest fabricator. Must be qualified to Estimate, Sell, and be able to train Draftsmen to detail placing drawings. This is an opportunity for the right man. Reply to P-6279, Engineering News-Record, listing complete information on Education and Experience. Salary open.

Engineers for municipal and industrial water supply, sewerage and treatment projects. Opportunities for permanent connection with long established firm of consulting engineers in mid-west. Both E.I.T.'s and engineers considered. Full information and reference in first letter requested. P-5889, Engineering News-Record.

Civil Engrs., Bridge Designers, Draftsmen. Design work. Steven Antonoff Cons. Engrs., 806 Park Ave. Bldg., Detroit 26, Mich.

PLANT MANAGER

for Southeastern pre-stressing and precast concrete operations. Similar experience preferred but practical background as a field construction superintendent with heavy reinforced concrete work acceptable. Degree not necessary. Good opportunity with growing company. Will have full responsibility with freedom to operate. Please give us full information about yourself. All replies confidential. Our employees know of this opening.

P-6340, Engineering News-Record
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

Heavy contractor, N. Y. State, needs man to assume charge of take off, purchasing, engineering, expediting. Requires sound background & responsible field experience in heavier water, sewer & treatment plant work. Excellent opportunity for qualified person seeking & able to advance. Reply to P. O. Box 147, Colvin Station, Syracuse, N. Y.

Prestressed concrete design engineer. Excellent opportunity to advance with new plant being built by large company initially starting in this field. Permanent position with company benefits. Send qualifications and starting salary desired to: P-6357, Engineering News-Record.

Director Public Works. $587-$715 Newark, Calif. To 45 years. Degree, Calif. Registration required. For Announcement, Application, write City Hall. Filing deadline Oct. 25.

Civil Engineer—experienced in Design of Sewers, Sewerage Disposal Plants, Pumping Plants, Water Systems—General Engineering Practice—Salary open—Upper New York State. P-6384, Engineering News-Record.

Chief of Party—experienced—familiar with layout sewer, pavements, water works also general surveying. P-6391, Engineering News-Record.

Wanted Sales Engineer Expanding 55 year old manufacturer of metal building products, including deck, wall and floor panels, windows and doors, seeks sales-minded engineers or equivalent experience in the construction field. Man selected will be trained and sent out to do field promotional work with architects and engineers before assignment to a regional sales office. Send resume to: Personnel Director, Fenestra Inc., 2250 East Grand Blvd., Detroit 11, Michigan.

Civil Engineer—$5349-$6549. **Public works** and utilities engineering for progressive growing, industrial city of 70,000 population. Application and brochure of city available. Write Personnel Officer, Municipal Building, Hamilton, Ohio.

Splendid opportunity for 2 Young Engineers—Foundation Contractor has opening in New York and also in New England area. Some field experience desirable. Send resume including references, availability and salary wanted to: P-6399, Engineering News-Record.

Superintendent, Building Construction. Highly capable superintendent wanted for company operating in eastern part of West Virginia, Maryland, Southern Pennsylvania and Northern Virginia. Furnish details as to experience, references, education and when available. P-6400, Engineering News-Record.

EMPLOYMENT SERVICES

Better Positions—$6,000 to $15,000. Want a substantial salary increase, more opportunity or different location? This national 47 year old service connects you with best openings. You pay us only nominal fee for negotiations: This we refund when employer pays placement fee. Present position protected. In complete confidence, write for particulars. R. W. Bixby, Inc., 559 Brisbane Bldg., Buffalo 3, N. Y.

Engrs. Designers, Draftsmen, all fields Chem. Metallurgists, I.E.'s use our national coverage. Guilford Personnel Service, 502 American Bldg., Balto. 2, Md.

POSITIONS WANTED

Civil Eng. 31, married, B.S., M.S. in structures. 6 years experience in construction and estimating. Recent graduate of accredited law school. Top fourth of class. Will consider any opportunity. PW-6117, Engineering News-Record.

BSCE EIT 23 eighteen months experience on inspection and administration of construction contracts for the Navy. Varied construction experience while attending college. Seeks start with general contractor in Chicago area. Available 15 November 1957. PW-6099, Engineering News-Record.

Construction Executive: 20 years sound experience, Engineering and Project Manager, Estimating, Supervision, Management. Industrial building construction and mechanical installations from customer contact to completion of projects. Desire permanent connection with expanding Utility on power plants or Engineering and Construction Firm. PW-6242, Engineering News-Record.

Civ. Eng.; BCE, PE., 10 yrs. experience heavy construction. Chf. estimator roads, bridges, paving, sewersc, gas & water lines, all types excavation. Bids, subs, costs, administration. N. Y., N. J., Conn. only. PW-6047, Engineering News-Record.

Civil Engineer, 32, BS, MS (Structural), Registered, 8 years varied domestic and foreign experience in teaching and in design, construction and maintenance of highways, railroads, bridges, chemical and petroleum process plants. Desires permanent position in Southern U. S. PW-6322, Engineering News-Record.

Gen. Superintendent available Oct. 15. Industrial or Commercial. Just completing 18 million dollar project. Age 44—References furnished by present employer. PW-6291, Engineering News-Record.

Architect, 36, A.I.A., N. J. Registration. Broad experience all phases of office work, specifications, engineering, coordination, client-contractor relations. Desires responsible position in N. Y.-N. J. area. Free to travel. PW-6245, Engineering News-Record.

Superintendent Const. 20 years experience, Institutional, commercial, industrial projects. Engineer. PW-6329, Engineering News-Record.

(Continued on page 398)

CONSTRUCTION MANAGER

30 years experience in all phases of industrial and heavy construction. Proven ability in complete handling of company multi-project operations, promotional selling and developing of prospects. Reply:

PW-6343, Engineering News-Record
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

BRIDGE DESIGNERS DETAILERS

We have a number of openings for experienced Bridge Designers and Detailers. No arbitrary length of previous employment is established; selection will depend on the design know-how and judgment a man has absorbed from his own particular experience. Only engineers with a sense of responsibility and a professional approach to their duties will be accepted.

The work involves varied types of structures for highway systems. Some of the position carry supervisory responsibilities; these positions require men willing to handle the organizational and administrative problems connected with major engineering projects. In some cases, the work will require contact with the firm's clients where the ability to present and discuss an engineering problem intelligently is essential. Junior personnel with the firm are given priority for these positions when they become qualified.

Salaries depend on the individual and are individually negotiated. Increases are based primarily on merit. Other benefits are liberal. Openings also in Rochester, N. Y. office.

CAPITOL ENGINEERING CORPORATION
DILLSBURG, PENNSYLVANIA

Highway Engineers - Designers & Draftsmen
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Permanent employment for qualified men. Ample opportunity for advancement based on merit; plus excellent retirement program, group life insurance, hospitalization, paid vacations and holidays. Salary commensurate with experience.
Architectural openings in Rochester, Pa. Highway & Bridge openings in Pennsylvania, Maryland, Mississippi, Ohio & West Virginia.

Air Mail Resume To: R. L. SHAW, *Personnel Director*

MICHAEL BAKER, Jr., INC. Baker Bldg. Rochester, Pa.

REQUIRED FOR OFFSHORE CONSTRUCTION

One Electrical Superintendent
One Mechanical Superintendent

Must take charge of all field construction work and have engineering background to estimate work when required.

Send resume or apply in person

PETER KIEWIT SONS CO.
545 South Broad St. Trenton, New Jersey

JOB OPPORTUNITY

EXPERIENCED EARTH MOVING EQUIPMENT SERVICE MANAGER.
UNDER 38 YEARS OF AGE.
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ONE OF WORLD'S LARGEST HEAVY EARTH MOVING EQUIPMENT DEALERS, IDEALLY LOCATED IN WORLD'S FINEST CLIMATE.
COMPANY BENEFITS AND PROFIT SHARING PLAN.—SALARY OPEN.

SEND QUALIFICATIONS AND PHOTO TO

P-6083 Engineering News-Record, 1125 W. 6th St., Los Angeles, Calif.

STRUCTURAL DESIGN

Major producer of steel buildings has opening for design engineer. Experience with cold formed plates and sheets helpful. Permanent postion in Midwest. Send resume.

P-6274, Engineering News-Record
520 N. Michigan Ave., Chicago 11, Ill.

COMMUNITY PLANNER II

$5,722-$6,622 (excluding longevity salary increases). Education and experience equivalent to graduation from a design program in planning. For work involving phases of the Master Plan and Urban renewal planning. City Personnel Dept., 404 City-County Bldg., Madison 9, Wis.

CONSTRUCTION ENGINEERS

Foreign Employment

Career opportunity for graduate chemical and mechanical engineers for construction work in Saudi Arabia. Degree essential. Minimum 10 years experience supervising construction of oil processing and oil handling facilities. To supervise actual construction by contract or service organization personnel involving control over construction methods, scheduling, expediting and progress; utilization of men and materials; and the inspection of workmanship for compliance with plans and specifications.

Salary commensurate with experience plus living allowance and generous all-inclusive benefits. Excellent community facilities.

Write outlining background and experience. Please include your telephone number.

Recruiting Supervisor, Box 214

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

Graduate Civil Engineer

Excellent opportunities with nationally recognized organization engaged in engineering service work in highway and concrete fields. Location southern Illinois and covering surrounding areas. Permanent posiiton. Salary based on qualifications and experience. Car allowance and expenses. Excellent benefits and retirement program.

P-6365, Engineering News-Record
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

ENGINEERS

Long established firm of consulting engineers with world-wide practice needs experienced civil, electrical, mechanical and foundation engineers for interesting work on large dams, powerplants, and river control works. Permanent positions. Liberal employee benefits. Starting salaries dependent on qualifications. Please send complete resume to Hugo Niemi, Personnel Manager.

HARZA ENGINEERING CO.
400 W. Madison St. Chicago 6, Ill.

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to expedite the handling of your correspondence and avoid confusion, please do not address a single reply to more than one individual box number. Be sure to address separate replies for each advertisement.

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Positions in California State Government in a variety of locations throughout the State for recent college graduates.

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Office and field work in California's dynamic highway program.

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Design and field work in California's multimillion dollar bridge program.

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Engineering control of water supply and waste disposal, air pollution and industrial hygiene.

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Engineering studies and design on California's growing water problems.

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Junior positions—no experience

$481 to $530 a month

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Positions open at these levels only.
U. S. citizenship required.

Send resume to: C. S. Warner, Supervisor, Section E, 801 Capitol Ave., Sacramento 14, Calif.

PROCESS EQUIPMENT ENGINEER

To prepare process flow diagrams and equipment specifications for raw materials handling and iron and steel production facilities.

Some engineering experience required, preferably in a metallurgical industry. Operating experience desirable. Engineering degree required.

WRITE TO OR CALL
G. VICTOR HOPKINS

ARTHUR G. McKEE & CO.
2300 Chester Ave., Cleveland 1, Ohio
Telephone TO-1-2300

SALES ENGINEERS

A major steel company has need for sales engineers to promote and sell fabricated products in middle Atlantic states. Excellent opportunities for men 25 to 30 years old with engineering background and a desire for sales work. Attractive starting salary with company car, expenses and bonus plan.

SW-4684, Engineering News-Record,
Class. Adv. Div., P.O. Box 12, N. Y. 36, N. Y.

ENGINEERS

(OVERSEAS)

FAMILY PROVISIONS TWO-YEAR CONTRACT

Water Supply Sewerage

Civil-hydraulic background on planning, designing of water-sewerage treatment plants, distr. systems, pump stations.

Dam

Civil, qualified in dam design, investigate rock structures, key-ways. Evaluate dam locations and type of dams.

Soils Laboratory

Experienced in laboratory procedures and techniques in problems of soils, concrete, etc. Hydraulic model testing desirable.

Ground Water Hydrologist

Civil, qualified with good knowledge of hydraulics experience in ground water projects, small municipal water and sewerage systems. Know specifications, estimates and select equipment.

SEND RESUME TO:

R. J. NUSSELL

PARSONS

617 So. Olive Room 1103
Los Angeles 14, Calif.

CONSTRUCTION SALES MANAGERS

Present expansion plans have opened up two positions for Area Construction Sales Managers. We need someone who has an outstanding sales record in general construction work and who is particularly familiar with industrial and commercial possibilities in the Southern Jersey, Pennsylvania, Delaware and Maryland areas and in the Michigan, Ohio and Western Penna. areas. We are only interested in talking to able, proven negotiators with good industrial and commercial contacts. Proven managerial ability is one of our prime requisites. You will be responsible for personal sales as well as directing the sales activities of others. Applicants are preferred to have Engineering degrees and extensive construction experience. This Company offers the back-up assistance of a large staff of Engineers, estimators and field construction people. This is not a soft job but to a producer it will be an excellent position. Please send a complete resume of past experience when requesting an interview. All of our present personnel know of this advertisement.

P-6275, Engineering News-Record
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

STRUCTURAL

ENGINEERS
DESIGNERS
DRAFTSMEN

Prefer several years or more experience in any of these fields:

BRIDGES

BUILDINGS
EXPRESSWAYS
HYDRO PROJECTS
TEST FACILITIES*

Will consider lesser experience with good educational background, including several recent graduates to round out a planned expansion program. Occasional openings for combination field men. These are permanent additions to our regular staffs.

We are professional engineers engaged primarily in design which covers a wide scope of practice. The variety and unusual character—for example, the proposed world's largest bridge project—offer excellent opportunity for professional development and advancement.

Immediate openings in our St. Louis general offices and occasionally in our San Francisco branch office. Confidential interviews can also be obtained at Washington, D.C., and Portland, Oregon.

Paid vacation, sick leave, holiday, overtime. Excellent Employee Benefits Plan provides retirement income plus life and disability insurance. Blue Cross. Moving allowance.

Please write fully, including salary data, to

SVERDRUP & PARCEL, Inc.
ENGINEERS — ARCHITECTS
915 Olive St. Louis 1, Mo.

*We are designers of the technical facilities for the Arnold Engineering Development Center, operated by our subsidiary, ARO, Inc.

WATER POWER ENGINEER

Southwestern firm seeking competent engineer to head group engaged in investigations, economic studies and designs of hydro-electric, flood control and water supply projects. Experience in earth and concrete structures, tunnels, control work, etc. mandatory. Must be in good health, aggressive and willing to travel as required. Submit complete resume. Immediate acknowledgement.

P-6298, Engineering News-Record
520 N. Michigan Ave., Chicago 11, Ill.

ASSISTANT CHIEF ENGINEER

We currently have a staff of approximately 80 engineers. We are looking for an Asst. Chief Engineer between the ages of 40—50 years. We need a man with extensive general construction background in institutional, commercial and industrial buildings. Steady, continual growth of this Company has created this position. A very excellent growth position is open to the person who can qualify. When answering please send a detailed resume of your past experience. Our present staff is familiar with this advertisement. This position is ready made and waiting for the fellow who is bumping his head on advancement in his present firm.

P-6273, Engineering News-Record,
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

PLANNERS

Community Planner IV. New. $7,170-$8,550 (excluding longevity salary increases). Education equivalent to graduation from a university planning program with the equivalent of at least 5 years' experience in planning work. Considerable experience in dealing with public groups essential. Direct the Master Plan Program for this city and its extraterritorial area.

Community Planner III. New. $6,220-$7,240 (excluding longevity salary increases). Education equivalent to graduation from a design program in planning with the equivalent of 4 years' experience in planning work. Assist in the preparation of Master Plan reports for the city and its extraterritorial area.

Personnel Department
404 City-County Building
Madison 9, Wisconsin

CIVIL ENGINEERS

Permanent position with consulting engineering firm in Corvallis, Oregon. Wide variety of interesting work in the design of water supply and distribution, water treatment, sewers, pumping station and sewage treatment facilities. Men with college degree and one to five years design experience desired. Pleasant living conditions close to work in college community. Give references, experience and starting salary expected in letter to:

Cornell, Howland, Hayes & Merryfield
P. O. Box 612, Corvallis, Oregon

STRUCTURAL ENGINEER

Graduation from a college or university of recognized standing with a degree in engineering, specializing in structural engineering, and 3 years experience in a responsible capacity involving design of all sizes and classes of buildings and structures or an equivalent combination of experience and training. Salary $6136-$7436 per annum. Complete details by writing to Director of Personnel, Municipal Building, Hartford, Conn.

POSITIONS WANTED
(Continued from page 395)

Field Engineer—Asst Superintendent college graduate 9 years experience building and industrial construction seeks position northeastern US resume on request. PW-6220, Engineering News-Record.

Const. Superintendent—Building Estimator, 33, Graduate C.E., 12 years experience. Desires responsible position Central, South America, or Foreign. PW-6345, Engineering News-Record.

Young Executive C.E. 10 years experience pile driving, dredging heavy foundations, bulk head, and brick water const., desires position with positive future in progressive engineering or construction co. PW-6348, Engineering News-Record.

C.E.—9 years experience—(3 in Latin America) on highway, dam, drainage, grading, and railroad design and construction. Desires position with Engineer or Contractor in Central America. Fluent Spanish. PW-6349, Engineering News-Record.

Energetic Civil Engineer seeks supervisory position, minimum $12,000 yearly. Broad experience as owner's and contractor's engineer includes road and railroad location, very large topographical surveys, highway construction, docks, pulpmills, steam plants, large airbases and defense projects up to $60,000,000. Presently completing assignment as contractor's Project Engineer on large vehicular tunnel. PW-6361, Engineering News-Record.

C.E., P.E.; age 34, self-emp., sanitary, municipal, highways; desire position. PW-6360, Engineering News-Record.

POSITIONS WANTED

BSCE, 28 married, desires responsible position in gen. C.E.; pref. field. 3½ yrs. exp. in heavy industrial const. & highway design & const. Wish to locate in W. Va. or Va. area. PW-6328, Engineering News-Record.

Highway Engineer, 38, BSCE, P.E. Proven administrative and technical ability in top assignments. Eager to pioneer new ideas and assure responsibilities. Present salary $12,000. Wish to work for progressive reputable company on bonus arrangement. PW-6359, Engineering News-Record.

Civil Engineer—B.S.C.E. Age 34, Registered. Experienced—Municipal, Sewers and Sewage treatment, Industrial. Desire to relocate Southeastern Coastal Area. PW-6383, Engineering News-Record.

Project Engineer—34—B.C.E. Licensed in N.Y. 9 years experience in construction and design of structures. Experienced in contract administration, job planning, scheduling, coordinating and estimating. Desires position New York City or L.I. area. PW-6393, Engineering News-Record.

Carpenter Superintendent—33 married. 11 years experience on bridges, buildings, and tunnels. 1 year Engineering background. Available immediately, will travel anywhere in States. References on request. PW-6392, Engineering News-Record.

SELLING OPPORTUNITY WANTED

Arsavial, S.A.—Marques de Cubas No. 6— Madrid, Spain, interested contact manufacturers of agricultural tractors.

SEARCHLIGHT SECTION

(Classified Advertising)

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CHICAGO: 520 N. Michigan Ave. (11)
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all U. S. Graduate Engineers
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Engineers—Foremen—Office Men

Learn latest methods to organize and run work. Prepare for the top jobs.
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If you have it, we'll sell it. . . . If you want it, we'll find it.

Bole & Company

Used Construction Equipment
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50—Clamshell Buckets, ranging from ½ yd. to 2 yd. Heavy duty digging. General Purpose and Rehandling type. Owens—Blaw-Knox, Johnson, Williams, etc.

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GROVETON, PA., Box 43-J, Sub. of Pittsb.
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VALVES and FITTINGS
All Sizes in Stock
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RAILS

NEW — RELAYING — TRACK ACCESSORIES
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7400 Marion Dragline, 160', 13 yd.
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120-B Bucyrus Erie Elec. Drag, 115', 5 yd.
5-W Bucyrus Monighan Drag, 120', 5 yd.
2400 Lima Drag, 130', 5 yd.
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111-M Marion Diesel Drag, 100', 4 yd.
1055 P&H Dragline, 90', 3½ yd.
K595 Link Belt Drag, 85', 3 yd.
1201 Lima Drag, 85', 3 yd.
1201 Lima Comb. Shovel-Crane
955 P&H Dragline, 90', 2½ yd.
54-B Bucyrus Erie Drag, 85', 2½ yd.
54-B Bucyrus Erie Comb. Dragline-Crane
3500 Manitowoc Drag, 85', 2½ yd.
40-A Marion Dragline, 90', 2½ yd.
1001 Lima Dragline, 83', 2½ yd.
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51-B Bucyrus Erie 2 yd. Shovel
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38-B Bucyrus Erie 1½ yd. Shovel
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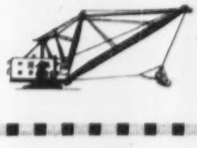

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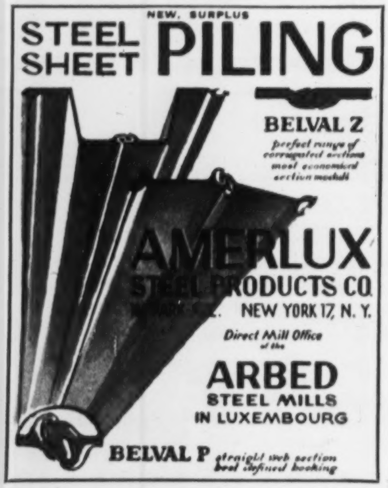
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Model 15 A Diamond Crushing Plant, 15 x 24 Jaw Crusher, 30' x 8' Apron Feeder, Hooner 24" x 26' Conveyor, Gasoline Engine or Pneumatic Tires.

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24 x 16 Rolls—3' x 8' Screen-on Wheels, with gasoline engine and four belt conveyors.

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FS-6236, Engineering News-Record
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120 ton Johnson automatic batching & mixing plant U. S. Eng. Spec.
Pumpcrete-200 double with 750 ft. 8" pipe

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300 H.P. Elec. Motor Speed 585

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FS-6302, Engineering News-Record
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UNUSED 6x6 ARMY TRUCKS

***2½-TON, GMC & INTERNATIONAL**

- **From Government Storage!**
- **Unused and Guaranteed!**
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- **Reconditioned trucks also available!**

Why invest in expensive new trucks and equipment needed to get the roughest off-road jobs done when you can save up to $3,000 on ONE truck alone—and get the job done right!

Compare our tandem axle trucks with front wheel drive, 10 forward speeds, overdrive and new mud and snow tires with similar equipment elsewhere. See for yourself how TWO of our trucks cost you even LESS than one new truck!

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Construction and automotive equipment and parts
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Belt type granular separator with 18″ main belt and 3 cross belts. Complete with rectifiers and electromagnets, 220 volt.

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Two Model 36TD's, Torqmatic Transmissions, Cummins 300 H.P. Diesel Engines. Three Model 31TD's, 10 speed Transmissions, Cummins 300 H.P. Diesel Engines. Immediately available subject to prior sale or disposition.

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GMC Diesel. Good Condition
Priced to Sell

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Capacities to 70 Tons
Booms to 140 ft. and 30 ft. jibs
Special rates on long rentals

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THE MOST COMPLETE AND VARIED STOCK OF USED CONSTRUCTION AND MATERIAL HANDLING EQUIPMENT ON THE ATLANTIC SEABOARD

CONCRETE EQUIPMENT—Mixers, Vibrators, Grinders, Finishers and Buggies
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RENTALS **—RENTAL SERVICE CO—** *SALES*

OVER 40 YEARS OF SERVICE
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World's Best Rebuilts

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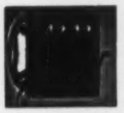

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first New Highway-Act pavement...

POZZOLITH* employed in concrete to better control:

Placing the *first concrete pavement* in the 41,000-mile Interstate Highway System to be constructed under the Federal-Aid Highway Act of 1956: A 4-mile stretch of 24-foot concrete pavement on U.S. Route 40 west of Topeka, Kansas. Kansas State Highway Commission. Contractor: Koss Construction Co., Kansas Division. Pozzolith employed in concrete.

1. *Water content* . . . makes possible lowest water content for a given workability.
2. *Rate of hardening* . . . provides desired time for handling, placing and finishing under widely varying job conditions.
3. *Entrained air* . . . provides optimum air content without sacrificing strength or other desired qualities.

This combination of controls obtained with Pozzolith provides, most economically, the properties desired in both plastic and hardened concrete.

Any one of our more than 100 seasoned fieldmen will be glad to demonstrate the full benefits of Pozzolith for *your* project, and to advise of the availability of Pozzolith Ready-Mixed Concrete through more than 1000 qualified producers.

*POZZOLITH . . . Master Builders trademark for its water-reducing, air-entraining admixture for concrete. Since 1932 employed in over 150,000,000 cubic yards of concrete for projects of every type.

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There is a type of asphalt pavement to fit the need

For example, on this highway — 78 miles from contractor's asphalt plant — Texas laid hot-mix, cold-laid Texaco Asphaltic Concrete

Blade graders spread the hot-mix, cold-laid Texaco Asphaltic Concrete surface in a series of thin layers.

Multi-wheel rubber-tired rollers are used for initial compaction of asphalt surface.

A 10-ton three-wheel roller gives final con
paction to Texaco Asphalt pavement o
US-290 in Texas.

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San Antonio, Texas

The variety of road and street types which may be constructed with Texaco Asphalt products offers an important advantage to the road builder. These types differ in durability and in cost. One of them will supply the right answer to your paving problem, whether you are constructing a highway or street, airport or parking area.

In the case of the Texas state highway pictured here, the project was located 78 miles from the contractor's asphalt plant. This called for a type of asphalt mix which, after the long haul from the plant, still retained its workability when delivered on the job. The answer was hot-mix, cold-laid Texaco Asphaltic Concrete. Laid on a crushed stone foundation and a subbase of select material, it provides a durable yet economical pavement. Completely flexible from subgrade to surface, this pavement will absorb heavy impact year after year with a minimum of upkeep.

In plant-mixed types of Texaco Asphalt paving, either asphalt cement or cutback asphalt is used as the binding agent. Helpful information on methods and materials recommended for this important class of asphalt pavements is supplied in the booklet, "Plant-mixed Texaco Asphalt Paving." Our nearest office will be glad to send you a copy.

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